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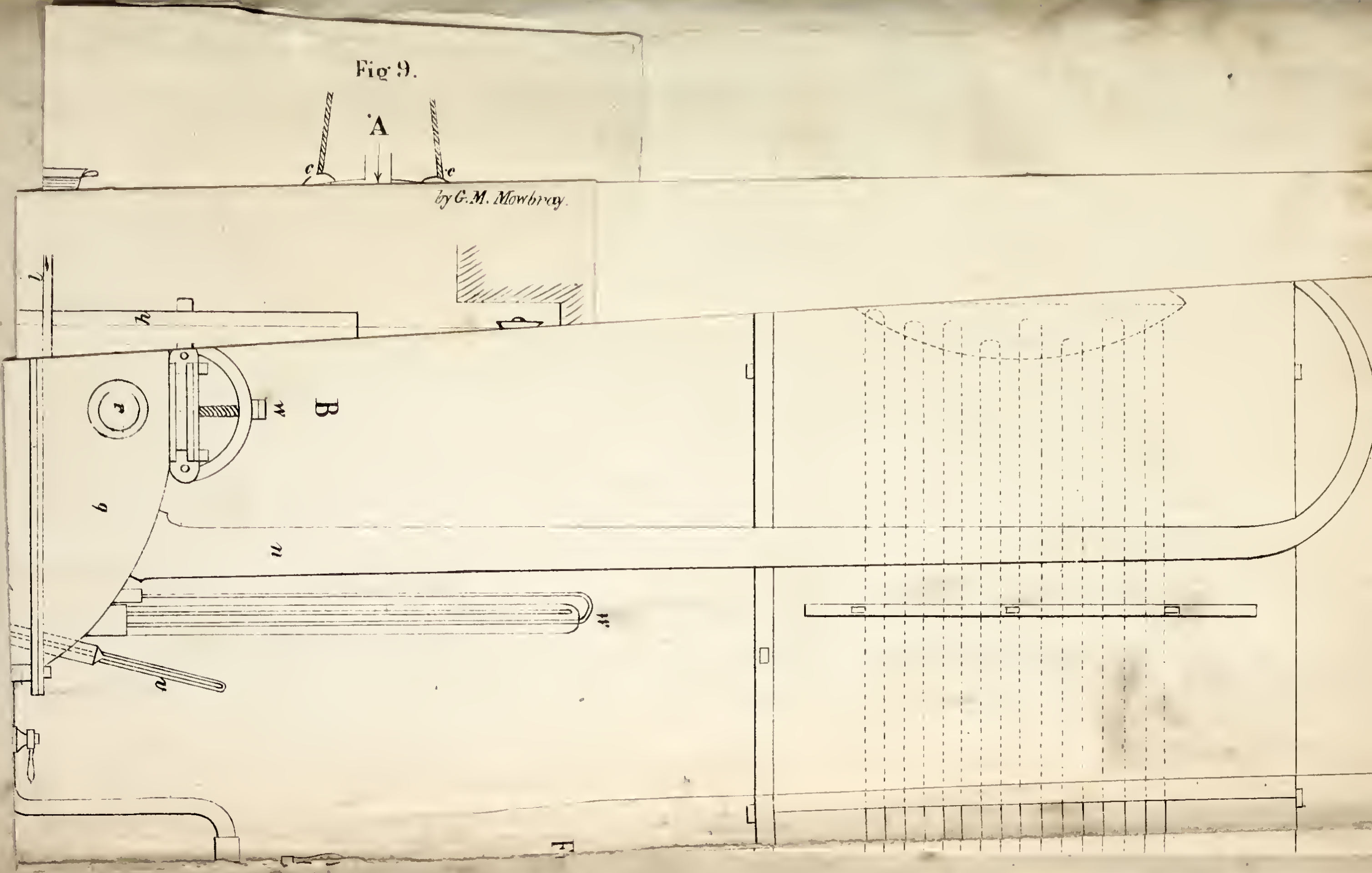
Fig 9.



by G.M. Mowbray.

Fig. 7.

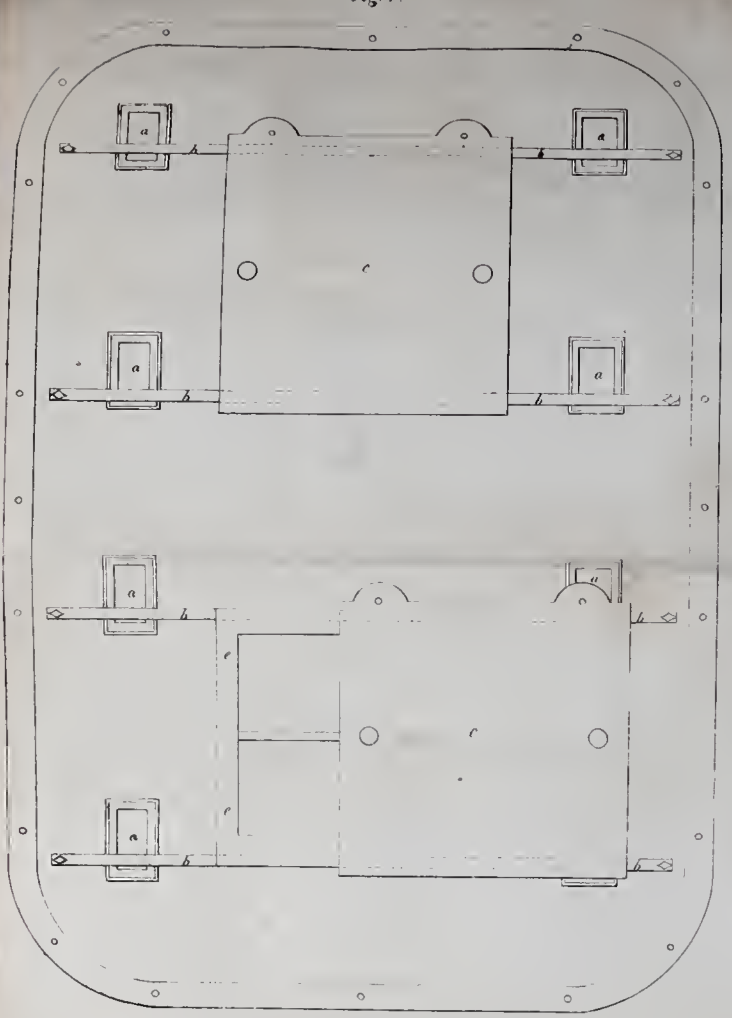
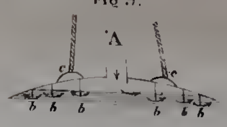


Fig. 1.

Fig. 9.



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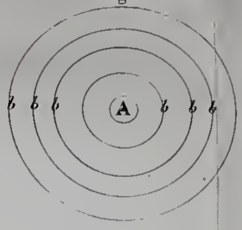

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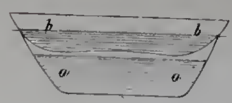

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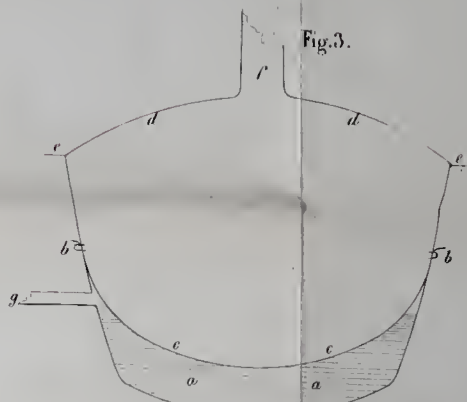

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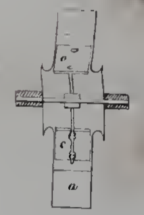

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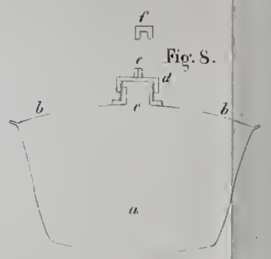

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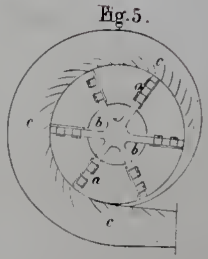
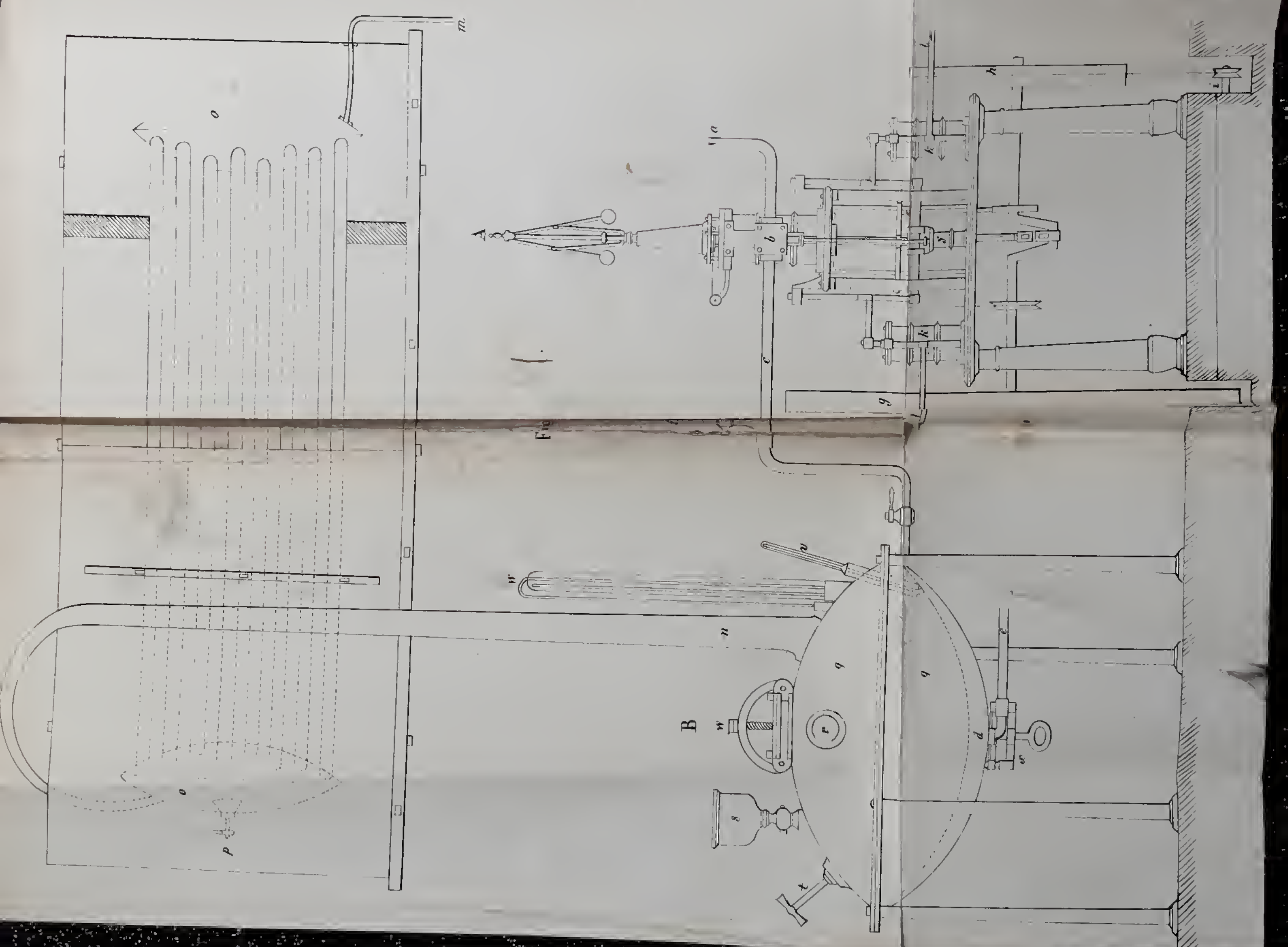


On Vacuum Extracts

by G. M. Mowbray



THE CHEMIST;

OR,

REPORTER OF CHEMICAL DISCOVERIES AND IMPROVEMENTS,

AND

PROTECTOR OF THE RIGHTS OF THE CHEMIST AND CHEMICAL MANUFACTURER.

EDITED BY

CHARLES AND JOHN WATT.

VOL. IV.

VOL. I. NEW SERIES.

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INTRODUCTION.

It is now our pleasing task to address our readers on the completion of the Fourth Volume of The Chemist, and to thank them for the very substantial support with which they have rewarded the very great labor we have bestowed on this work.

The increase of size and price which, at the commencement of the present year, we found it necessary to make, was a hazardous experiment; but it has succeeded even beyond our hope, and the sale of the work has continued to increase, from month to month, to such an extent as to render its continuance a matter of absolute certainty. We look forward, therefore, with pleasure, to making many more annual addresses to those for whose instruction we cheerfully labor, and whose support enables to continue, and stimulates us to extend, our exertions.

At the period when our work was started, there was no journal devoted to the same subjects. That one was much wanted, is proved by the fact that upwards of 2,000 copies of the First Number were sold. Since then, and especially within the last few months, the increase has been very considerable, with every prospect of even greater progress being made.

Within the last twelve months, however, our success has led to the establishment of two other journals: one of which existed for a few weeks, and then became extinct; the second, started with the *professed* object of "upsetting The Chemist," under the auspices of parties who are personally inimical to us, has failed in attaining the end for which it was established. We have stood uninjured by, and will ever deride the efforts of, the malignant endeavors of the enemies our success has arrayed against us, fully expecting that they will fail as signally in their struggle to maintain their own position as they have done in their attempts to eject us from ours.

The care bestowed on the editing of The Chemist—the vast amount and great variety of its contents—the high character of the sources from which its matter is derived, and the undaunted vigor with which its columns have been made the medium of the exposure of abuses—all these qualifications combine to render this journal deserving of the appellation which it has gained—that of "the leading chemical periodical" in the United Kingdom.

Were the term "leading periodical" intended to refer to any *comparison* of this with other works, the compliment would sink into utter insignificance in our estimation; it is not employed to *class* it with them, but to designate it as a standard work of science, and as an authority of high character.

Those works which have crept into existence since the establishment of this journal are of a character which will not admit of their being viewed in competition with it, and when mentioned, it must be in contrast, not in comparison; and those which preceded it obtained but a very limited circulation, chiefly confined to the older class of chemical readers who were actuated by respect for the Tillochs and Nicholsons of some forty-five years back, who would now make a very poor figure, unless they were drilled for some time in the new school. Our deep concern and anxiety for our national credit and honor, with regard to science, cause us to shrink with humility when called on to notice productions such as have lately appeared, and which are so much below the lowest grade of mediocrity that we cannot but lament the frequency of that intolerable nuisance—the *cacoëthes scribendi.* It would indeed give us much pain if these efforts were evidences of the state of science in this kingdom, far behind, as we regret to state it is, that of the Continent; but, happily, they expose only the ignorance of their authors.

Of very few journals of science has it been the lot to survive, much less to advance in public favor, for four years.

From our first number, we have labored, with no common pains and zeal, to promote the cultivation and encouragement of chemistry, as the means most conducive to the prosperity and happiness of a people among which flourish the arts of civilised society, and to whose very existence science is almost indispenable; and, looking at the results of its application to agriculture and physiology alone, we see still greater reason for urging its claims on those, who, from casualty, occupy the "'vantage ground," feeling assured that its pursuit is far more honorable than horse-racing and such like frivolous diversions as occupy nearly the whole of the junior branches of the aristocracy. No gentleman's education can be complete without it; and every mechanic's condition would be improved by an acquaintance with chemistry, if he have the industry to acquire and the tact to apply it: there is no source whence improvements in the arts and manufactures can be so amply derived as from this science, from which new channels of profit and employment are of daily occurrence, and by means of which objects of luxury and refinement are produced.

We proceed to notice the more important contents of this volume.

Among the more valuable translated and selected articles we may mention:—"On Pepsin, the Principle of Digestion, by Dr.

VOGEL, jun.; a valuable paper, by DUMAS and CAHOURS, "On the Neutral Nitrogenous Matters of Organisation;" "On Chemical Equivalents, considered as simple Multiples of Hydrogen," by M. PELOUZE; MARCHAND "On the Chemical Composition of the Bones;" Drs. HAIDLEN and FRESENIUS "On the Employment of Cyanuret of Potassium in Chemical Analysis;" "On the Quantity of Carbonic Acid Exhaled by the Human Lungs," by MM. ANDRAL and GAVARRET; FREMY "On the Metallic Acids;" LIEBIG "On the Nitrogenous Nutritive principles of Plants;" "Analysis of Organicand Mineral Charcoals," by M. LASSAIGNE; Dr. J. LAWRENCE SMITH "On the Action of Potassa on Cholesterine;" GUIBOURT "On the Intestinal Concretions of Animals, known under the name of Bezoars;" Dr. J. L. SMITH "On the Composition and Products of Distillation of Spermaceti, with some few Remarks on its Oxidation by Nitric Acid;" "On some Separations operated by means of Sulphurous Acid, and the Alkaline Sulphites," by M. P. BERTHIER; LASSAIGNE "On a Simple Process for Detecting the Presence of Nitrogen in Minute Quantities of Organic Matter;" GERHARDT's "Investigations concerning the Organic Alkalis;" MILLON "On the Oxygenous Compounds of Chlorine;" BERZELIUS, "On the Sulphurets of Phosphorus;" Prince LOUIS LUCIEN BONAPARTE "On a Means of Separating Deutoxide of Cerium from Deutoxide of Didymium;" LEWY "On Bees' Wax;" ROUSSEAU "On Ferments;" Professor MAGONTY, "On the Specific Gravity of Metals;" FORDOS and GELIS "On the Action of Sulphurous Acids on the Metals;" CHODNEW, "On the Action of Potassa on the Oxides of Copper, Iron, and Silver;" Dr. JULIUS HAIDLEN "On the Salts contained in the Milk of the Cow, and on the Analysis of Milk; "On Butyric Acid," by MM. PELOUZE and GELIS; PREVOST and MORIN "On the Digestion of the Herbivora;" WILL, "On the Determination of Nitrogen;" ROCHLEDER, "On Casein;" Dr. VOGEL, sen., "On the Action of Sulphurous Acids on Metallic Oxides;" "Experiments intended to Establish the Difference between Fluoboric and Hydrofluoboric Acids," by BERZELIUS; Dr. C. ENDERLIN "On the Acids of the Gastric Juice, &c., &c.;" with many other very interesting articles by H. Rose, Fordos and Gélis, Bineau, Silliman, Buchner, Liebig, Wöhler, Marchand, Dumas, Frémy, Matteuci, Gmelin, Bouchardat, Berzelius, Erdmann, Lassaigne, Tracconot, Malaguti, Berthier, Gerhardt, Petzholte, Pelouze, Levol, Millon, Laurent, Cahours, Rousseau, Gay-Lussac, Meillet, Boullay, Vogel, Dœbereiner, Péligot, &c., &c.

The principal original contributions to this section are by our talented friend Mr. REUBEN PHILLIPS (our former pupil), of Exeter, Mr. LEWIS THOMPSON, of the Royal Polytechnic Institution; Mr. R. W. FOX; Mr. J. S. MUSPRATT, of Liverpool;

Dr. Robert Hare, Professor of Chemistry, Pennsylvania; and Dr. P. J. Murphy, of Liverpool.

In the department of Chemical Manufactures and Agricultural Chemistry we have given many papers of great value, abstracts of many specifications of improvements in the Arts, and many articles calculated to advance the Agriculture of this country: we may point out as among the most interesting:—"On Thermography," by our esteemed correspondent, Mr. R. Hunt; Hochstetter "On the Formation of White Lead;" "An Improved Method of Obtaining Likenesses," &c., by Richard Beard; "On Galvanography," by Jacobi; "Improvements in Manures;" "On the Manufacture of the Alkaline Chromates, and on the Analysis of Chrome Iron Ore," by C. Watt, jun.; "Improvements in the Manufacture of the Carbonates of Soda and Potassa," by W. T. Clough; Waterton's "Improvements in the Manufacture of Sal-Ammoniac;" two memoirs "On Manures and their Comparative Values," by MM. Boussingault and Payen; "On the Analysis of Soils and Manures;" "Action of Ammoniacal Salts on Vegetation," by M. A. Bouchardat; "Production of the Guano of Commerce," by Dr. M. Hamilton; improvements in Dyeing Wool, Woollen Cloths, Cotton, Silks, and other Fabrics and Materials," by Peter Kagenbusch; "Fixation of Iron Mordants on Calico," by Schlumberger; "Investigations Concerning the Fattening of Cattle and the Formation of Milk," by Liebig, Dumas, Boussingault, Magendie, and Payen; M. Saint-Clair Duport's important memoir on the "Production of the Precious Metals in Mexico, Considered in its Relations to Geology, Metallurgy, and Political Economy;" "New Process of Polishing Daguerreotype Plates," by M. Daguerre; "Improvements in Paints;" "Process of Making Wrought Iron Direct from the Ore," by Mr. W. N. Clay; "On Guano or Huano," by MM. Girardin and Bidard; "The Smoke Nuisance; on the Production and Prevention of Smoke," by Mr. H. Dircks; Mr. Hunt "On Chromatype;" "On the Electro-Chemical Application of Oxides and Metals on Metals," by M. E. Becquerel. With many others of great importance.

In the department of Pharmacy, Materia Medica, Therapeutics, &c., we have given about 250 articles interesting to the Pharmaceutist. To give anything like an analysis of this portion of the work is, therefore, next to impossible. However, we may mention among the translated and selected articles:—Aubergier "On Lactucarium;" "Association of Sulphate of Quinine with Carbonic Acid in the Treatment of Marsh Fevers," by M. Meirieu; "Numerous Cases of Poisoning;" "Adulterations;" A Discussion, conducted with ability, on the Use of Malt Liquors; "On the Use of the

Unripe Fruit of the Diospyros virginiana, as a Therapeutic Agent," by J. P. METTAUER, M.D.; "Antidotes for Poisons;" "Toxicological Studies Concerning the Vegetable Alkalis," by A. LAROCQUE and A. THIBIERGE;" "On some Obscure cases of Poisoning," by Dr. CHRISTISON; "Deleterious Effects Produced by an Infusion of Tobacco Applied to the Skins of Animals," by Dr. JOHN S. HILEY; F. G. LEROY on "Processes of Preparing Syrups of Acid Juices;" "Papers on the Indian Hemp;" "Treatment of Gout with Carbonic Acids," by Mr. J. PARKIN; "Chemical and Toxicological Experiments Relative to Prussic Acid," by M. BONJEAN; "On the Special Function of the Skin," an ingenious paper, presented to the Royal Society by Dr. R. WILLIS. With useful papers by Meissner, Hooke, Lewinstein, Dr. Watson, Filhol, Buchner, Colla, Pitschaft, Du pasquier, Mililotti, Reinsch, Rousse, Stanley, Degrange, Salvolini, O'Shaughnessy, G. Boissière, Brousse, A. Bouchardat, Nasse, Meyer, O. Kohnke, Dr. Coulton, Dr. G. F. Collier, Dr. Bence Jones, Scharn, Bonjean, Barach, Professor Otto, Dr. T. J. Farre, Dr. Allé, Prince Louis Lucien Bonaparte, Soubeiran, Deschamps, Devergie, Calau, Lewis Thompson, A. J. Cooley, Davallon, Behrens, Dr. J. I. Nicol, Roelands, &c., &c., &c.

The valuable paper "On Medicinal Extracts," by our much esteemed friend, Mr. G. M. MOWBRAY, deserves especial notice, as the best Pharmaceutical paper in the volume, any expression concerning the character of which is quite unnecessary; our readers have, doubtless, attentively perused it, and cannot but feel grateful to its author.

In strict compliance with the principles by which we have ever been actuated in conducting this work, we have this year devoted much time, energy, and space, to subjects connected with the position of Pharmaceutical Chemists as a body. In several articles we have reviewed the Society which, numbering little more than three thousand, has arrogated to itself the title of the representative of those connected with the Pharmacy of Great Britain, who amount to more than ten times as many. We have proved it worse than uselessness, as at present managed; we have shown that there is no probabilty of its powers being extended; we have demonstrated that the provincial chemist is not placed on the same footing as his metropolitan brethren, except as to the amount of subscription. We have been unsparing and uncompromising in our denunciation of this Society and its management, and we will, desist from censuring it only when it ceases to merit reproof. Our readers must not suppose that we are sleeping; on the contrary, we have made up our mind to a course which must prove fatal to this Society, unless some very considerable reforms in its constitution be speedily effected; we "bide our time," and we will in the course of two or three months, array against the Pharmaceutical Society such damning proofs of its worthlessness as shall almost make every member ashamed of, and regret, his even *temporary* connection with it. Our endeavors have been strenuous and sincere, and ultimately they must and will prevail against this monstrous mass of abuse.

We have also found occasion to censure the manner in which the "Commission to Inquire into the Present State of Large Towns in England and Wales, with reference to the causes of health and disease among the inhabitants, has been constituted; and we have shown the incompetency of one Commissioner, and, when the Report is printed, we shall no doubt find much more matter for censure.

During a recent visit to Manchester and Liverpool, we devoted much time to examining into the state of those towns in this important respect, and we have given the result of our observations in the November number of this journal. We shall keep the subject in mind.

We take this opportunity of requesting our readers to alleviate our labors, and assist in advancing the science of their country, by communicating to The Chemist any observations on subjects connected with it which may occur to them, and we shall at all times feel indebted to those who contribute to it.

In conclusion, we may mention that we have many promises of valuable papers, on important subjects, by gentlemen highly competent to treat of them; and we have no doubt of rendering the next volume of The Chemist very far superior even to the one we have just completed. We have also some very important French and German Memoirs, by the most eminent chemists, to lay before our readers at the beginning of the year 1844. We have sources of matter and information not open to other journals, and of which we shall make extensive use for the benefit of our readers, to whom we sincerely wish full enjoyment of that festive season which, ere we again have the pleasure of addressing them, will have passed away, and in the anticipation of our fifth opportunity of wishing them a happy, prosperous New Year.

THE CHEMIST.

ADVERTISEMENT.

In presenting to our readers a new series of The Chemist, with the addition of another sheet, we feel it incumbent on us briefly to state the reasons which have induced—we might say, compelled—us to make this improvement and augmentation; and we feel convinced that all lovers of science, as well as those who are engaged in the departments of Chemical Manufactures, Agriculture, and Pharmacy, when informed that they arise entirely from the vast increase in the supply of matter from abroad, with the expectation of much that is original and important, on all the subjects connected with the work, from many esteemed and enlightened correspondents in this country, they will heartily join in our gratification and pleasure at the prospect, thus afforded, of the great advance of knowledge during the current year, evinced by the necessity of an enlargement, by one half, of that Journal, which, for the last three years, has been the only record and depository, in Great Britain, of the Chemistry of foreign countries and our own.

Our chief inducement to make this alteration is to supply our readers with all that they can require, without their being obliged to resort to works of an inferior character, and to save the expense of purchasing them. This we shall be able to do for the very moderate price of One Shilling. Each of our columns contains as much as an ordinary octavo page, printed in single column. Our 48 pages, therefore, are equal to 96 of the "Pharmaceutical Journal*", and we could reprint a whole No. of "The Philosophical Magazine*," and have some space to spare; consequently, if our work were printed in the same style as the former, we could well afford to sell it at Sixpence. It is necessary to mention these facts, to show how much more matter we can supply at the same charge, or less, than any other work not printed in double columns.

It is our intention to give all that we can collect from Continental sources, with as much original matter as we can procure in Chemistry, and its applications to the Arts, Agriculture, and Pharmacy; to use our influence, in a political and scientific point of view, whenever necessary, for the benefit of Manufacturers, Agriculturists, Chemists and Druggists, and the public; to uphold the rights of all; to continue, on a greatly increased scale, our exposures of Adulterations; to take cognizance of all matters connected with public health; in short, to neglect no opportunity of making ourselves useful to society. Our increased size will enable us to give many valuable papers of which our former limited space would not admit.

All important articles will be given (as heretofore) unabbreviated and unmutilated; when too long for insertion in one Number, they will be divided into more, but this division will always, when practicable, be avoided.

It is to us a source of no inconsiderable satisfaction, to reflect that the establishment of this work has had the happy effect of inducing a vast desire for chemical knowledge; as one among many proofs of which we may adduce the method now adopted of introducing into schools instruction in this beautiful and necessary science, besides the manifest and highly praiseworthy cultivation and study of it by the operative and mechanical classes, who very frequently display a knowledge of this and other subjects far greater in comparison than is obtained by those who occupy much higher stations, and who, from this circumstance, not from knowledge, too often look down with superciliousness upon them, from their greater advantages rather than greater acquirements. The late amiable and philanthropic Dr. BIRKBECK,—whose enlarged and liberal views ever formed the distinguishing characteristics of his mind,—adopted the enlightened plan of amending the moral and social condition of the mechanics of his country, through the medium of intellectual improvement, founded those valuable establishments called MECHANICS' INSTITUTIONS, and introduced courses of lectures on all subjects calculated to advance the artisan in his occupation, and to give him a knowledge of many other important subjects. Among the various branches of science upon which occasional lectures are given, he introduced CHEMISTRY, than which there is no science more important or more closely connected with the various occupations of mechanics. So long as these institutions endure, will the memory of their worthy and estimable founder be revered, and his loss regretted, as those of a benefactor and a friend.

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* It usually contains only 64 pages.

* Published at 2*s.* 6*d.*

Chemistry, it must be quite manifest to every intelligent mind, ought to form part of every liberal, we had almost said decent, education, as the means by which mankind may obtain an insight into the laws and operations of nature, and into the properties of the various substances with which we are surrounded,—subjects which deeply concern every one, as involving either the business of life, or the enlargement of knowledge.

We cannot but observe, among those whose occupations require the study of this science, that a very considerable increase has taken place in the desire for chemical knowledge since the publication of THE CHEMIST, and particularly among those engaged in the larger chemical operations, in whose establishments this work is invariably found. Among Chemists and Druggists, the greater portion, and the larger houses, have regarded it as their advocate from the first, and are its constant subscribers; and we trust that the emulation of the younger part of the trade will not feel content with, and limit their stock of scientific knowledge to, the puerile, ignorant, and twaddling Transactions attempted to be foisted on them by the agents of the Bloomsbury Square Society, or any other pretenders of this class; these productions convinced us "*ad aperturam libri*," that their conductors are unable to write one word. It was to improve the knowledge, condition, and respectability of Chemists, that our work was commenced. Now, after three years, we find ourselves in the situation of calling their attention to the increased means afforded us of rendering them still further benefit by enlarging our Journal, and adding thereto much valuable and important matter, and particularly on Agriculture, to which we intend to pay very considerable attention. Our past conduct is the best assurance and guarantee for the future, and we shall not regard as thrown away the greatly increased labor which will devolve on us, if our efforts receive that approbation and encouragement with which THE CHEMIST has hitherto been favored.

I. CHEMISTRY.

ON THE INFLUENCE OF TEMPERATURE AND CLIMATE ON THE FLUID AND SOLID STATES OF OILY AND FATTY BODIES.*

BY CHARLES WATT.

Of the innumerable varieties of organic bodies, there are none which assume such an endless diversity of peculiarities and changes of properties, accompanied by slighter and less evident deviations in their ultimate composition, as oils. Whether they are in the fluid or solid state, resolution into their elementary constituents and ultimate analysis of the products discover oxygen, hydrogen and carbon in them all, with such slight shades of difference, in the relative proportion of those bodies, as to compel us to acknowledge, that of these substances, and the causes of their diversified forms and characters, we are at present in total ignorance.

During a very long and laborious train of observation and experiment, certain facts have presented themselves, and have led to conclusions fully borne out by subsequent and more ample investigation, that may not prove unworthy of the consideration of our readers; I shall, therefore, proceed to give some of those facts which have come under my notice, and which appear most conclusive, but it is by no means my intention to offer any definitive theory in all cases, as these remain for future and much more minute research.

Very early in my prosecution of this subject, to which I was led in consequence of some extensive engagements with the view of improving the solidity of fatty bodies, and of decoloring certain oils, I arrived at the conclusion, that the different states of fluidity and solidity mainly depend, as regards those of the vegetable kingdom, on climate, and, as regards those of the animal kingdom, not only on climate, but on the temperature of the blood.

It seems hardly possible that it can have escaped the observation of chemists, that those oils which are solid at the ordinary temperature of our atmosphere are all the produce of hot climates, viz. palm oil, cocoa nut oil, and the oil of the tallow tree (*Stillingia sebifera*)* which is of the consistence of wax, while those only which are fluid are the produce of cold ones. In animals we likewise observe, that in the cold-blooded genera the oils are all fluid at the ordinary temperature of the atmosphere.

That the solid state of these bodies arises solely from the increased chemical action of the elements whence they are formed, in both vegetables and animals, cannot, I think, be doubted. I have not yet been able, with anything like precision, to trace in those of vegetable origin the causes which operate to produce this tendency; but in the animal kingdom, very many facts fully bearing out the views I have already stated have presented themselves, and, reasoning from analogy, throw much light on the mode of their production in vegetables.†

I shall now proceed to detail those facts which have come under my notice, and the observations arising from them, with regard to the oils and fat of the animal kingdom; and first it is necessary to state, that until about the year 1813, chemists were not acquainted with the two different states existing in oils. It was supposed, when, in hot weather, fats become soft and oily, that a portion of them had melted; and when, in cold weather, the fluid oils had become solid, that a portion had congealed. This is not the case, as all oils and fats, with the exception of seal oil, contain two distinct parts—the one fluid nearly at the ordinary temperature, *i. e.* at about 60°, and the other at about 130°: the former is termed elaïne, from ελαιον, oil; and the other stearine, from στεαρ, fat.

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* The immense pressure of business which has of late encompassed me has prevented me from contributing to this Journal so largely as I could have wished, but in future Numbers I shall give the results of some important observations, collected with great care.

* It is no refutation of this opinion to allege that, because they are not found solid in the regions of their production, climate is not the cause of their tendency to solidity. The species of tree, of course, has its share of influence, otherwise, were climate the sole cause, other oils would be subject to the same results, which is not the case.

† With the difficulty of tracing the various actions going on in those bodies, every chemist must be well acquainted; and until the subject receives some further elucidation from the researches of men of science, who may have opportunity, not much progress can be expected. We, however, do not despair of seeing the same benefits arising from the application of chemistry to vegetable anatomy and physiology, as has resulted from the labors and talents of Liebig to those of the animal kingdom. Sure are we that much good would be effected; and chemists have met and conquered difficulties quite as great, "possunt quia posse videntur."

In cold-blooded animals, the oil is of a liquid consistence, while in warm-blooded ones the more solid form abounds. In land animals, it is a very curious and remarkable fact that the quantity of hard fat diminishes progressively towards the extremities, where the elaïne is almost free from stearine, and is there quite fluid, as is shown in the oil about the feet of most animals. It increases, on the contrary, as it approximates to the heart and circulating organs; so that in these situations it contains nearly three fourths more stearine than elaïne, and in that portion surrounding the top of the ventricles, and which is derived from the coronary artery, it predominates in still greater proportion.

With these facts every one must be acquainted: yet no notice of these causes is to be found in Chemical or Physiological writers.

Another very remarkable fact is, that all the fat which is situated about the heart, kidneys, mesentery, &c., and which abounds in stearine, is encased in a very thin delicate cellular tissue, easily broken, as must be well known to every one who has observed with what facility suet is separated (whence its fitness for domestic purposes), while that fat, on the contrary, which is composed almost entirely of elaïne, is enveloped in a strong thick membranous substance of great tenacity and firmness.

In the numerous trials and experiments I have made, and in which the greatest care was taken, I have moreover found that a given quantity of fat taken from the same parts of the male and female animal, of the same age and species, yielded in the former invariably two and even three per cent. more stearine than in the latter; the same is the case in fleet animals as compared with slow ones, as is evident in the deer contrasted with the hog. It is manifest from the foregoing facts that the increased quantity of stearine in animals depends entirely on the energy of the vital system, and its greater preponderance internally in the same animal on its nearer approach to the great vital or circulating organs.

Another circumstance which claims particular notice, is the locality of fat in animals, which also tends greatly to prove the dependence it has on the energy of the vital system, for the quantity of stearine it possesses. Fat is found in great abundance about the trunk of the body,—and in this, either internally or at the surface,—and it is also found contiguous and external to muscle. In the interior it is composed chiefly of stearine: in the two latter situations of elaïne, as has already been observed. While this substance owes its existence to a peculiar chemical action going on in the adipose membrane, by which its two constituents, stearine and elaïne are generated, it is evident that as the higher action of the circulating system is internal, so does fat in the interior contain more stearine; and as at the external surface less powerful action is maintained, so does the external fat contain more elaïne.

I have examined the fats from all climates, and in conformity with the law here laid down, I have found, universally, that the proportion of stearine increases with the temperature of the climate, while the elaïne increases with its diminution. In warm weather in the same climate animals possess more stearine, and even that at the extremities is increased.

This provision of nature subserves very important purposes in the animal functions; for it must be evident that if, in cold climates or cold weather, the fat deposited beneath the skin and on the backs of animals were composed of stearine, it would be liable to be congealed, and thus greatly to impede their locomotive powers, and even to endanger their existence. If, on the other hand, the internal fat were of an oily nature, it would be no less injurious to the functions of the vital system, inasmuch as being contained in a thick and firm membrane, upon which it is extremely probable its oily consistence depends, the due performance of the functions of the viscera would be impeded, and the interior of the body encumbered with a weighty substance, while very inefficient support and protection from pressure would be afforded by fat of this consistence at the proper animal temperature.

If fish were encumbered with fat of such consistence, their motions would he perfectly obstructed. In this tribe no solid fat is found, except in the mammalia or warm-blooded species; and in these, as the cetacea, only in situations where there is no locomotion. In these animals, whose chief substance is muscular, and therefore containing a large proportion of nitrogen, there is not sufficient chemical action to generate the more solid fats, which belong exclusively to animals whose temperature is higher.

From the preceding facts, it is quite clear that climate and animal temperature have great influence on oils and fats, and the important purposes peculiar to each species, especially of animals, is maintained with the most undeviating precision and regularity.

Before quitting the subject, I must, however, observe, that, in the case of land animals, the existence of the thin membrane in the interior is as essential to admit of the rapid circulation to which the quantities of stearine is attributable, as is the thick one at the extremities, where its retardation is just as important for the functions which the parts are destined to perform.

No one can for a moment doubt the importance of this subject as closely connected, not only with organic chemistry, but with anatomy and physiology, nor fail to recognise a beautiful adaptation of chemical causes to the purposes of the animal economy.

I am ready to admit that some apparent exceptions to the previous statements may now and then occur; but these, upon due consideration, will be found wholly to conform to the observations modified by circumstances. Until time and opportunity shall admit of further and more conclusive data, I shall content myself with having called the attention of men of science to the consideration of a subject of such importance.

ON PEPSIN, THE PRINCIPLE OF DIGESTION.*

BY M. VOGEL, JUN.

Since Tiedemann and Gmelin have demonstrated the presence of free hydrochloric and acetic acids in the gastric juice, it has been considered that the acids contained in the stomach facilitate the solution of the alimentary matters; and so much the more as these acids possess the property of dissolving fibrin, coagulated albumen, and in general the combinations of proteïn.

The quantity of free acids contained in the gastric juice is, however, so small in comparison with the mass of aliment required to be dissolved in them, that it very soon becomes matter of inquiry as to whether the solvent action may be attributed to the acids alone, or whether there were not, besides the acids, other agents acting a part in the act of digestion.

Mr. Eberle ascertained that a gastric juice artificially composed was not endowed with the faculty of perfectly dissolving alimentary substances when there was not added at the same time some mucous membrane of the stomach, or else a piece of the membrane of the internal tissue of the stomach; but that then chyme was completely formed.

Basing their investigations on the assertion of this chemist, several physiologists made numerous experiments on this subject; and finally Warmann† and Schwann were enabled to extract from the mucous membrane of the stomach a peculiar substance, which they called *pepsin*, or the principle of digestion, because it had the property of completely dissolving aliment in contact with artificially prepared gastric juice.

The interest which this subject inspired, soon attracted the attention of chemists and physiologists. The great difficulty of procuring this substance in sufficient quantity and in a state of absolute purity, has, doubtless, been the reason that no elementary analysis of pepsin has hitherto been made, although the knowledge of the chemical constitution of this substance is indispensable, if it be desired to make any useful application of it to either medicine or physiology. I therefore thought I should render some service to science by devoting myself to the elementary analysis of this so-called principle of digestion.

To isolate pepsin, I used the fresh stomachs of pigs. I separated the glandular skin from the serous portion of the stomach, and after having cut it in small pieces, I treated it with cold distilled water. After twenty-four hours' contact, I decanted it, and poured on the pieces fresh quantities of water. This operation was repeated for several days, until a putrid odor was manifested. The aqueous infusion thus obtained was precipitated by acetate of lead. The white flocculent precipitate which resulted contained pepsin, accompanied with much albumen. This precipitate was divided into a flask filled with water, and decomposed by a current of sulphuretted hydrogen. On filtering the liquid, there remained on the filter coagulated albumen with sulphuret of lead, and the liquid contained pepsin with acetic acid. A very small quantity of acetic acid added to the solution of pepsin and acetic acid, was sufficient to render it fit for the arrangement of artificial digestion.

To obtain pepsin in the solid state, it was necessary to evaporate the filtered liquid to a syrupy consistence, avoiding ebullition, and absolute alcohol was afterwards added to it. There was formed, at the end of some time, a bulky, whitish precipitate, which was dried in the air. It was a yellowish, viscous mass, with a peculiar odor. The pepsin obtained in this manner has an acid reaction, because it always contains acetic acid. To completely separate this acid from it, I tried several experiments without arriving at a perfectly satisfactory result; for, although by dissolving it several times in water, and precipitating it by absolute alcohol, it lost, at each precipitation, some acetic acid, yet it was impossible, by this means, to entirely separate the last traces. To effect this object, I heated a quantity of pepsin, prepared in the above manner, for some hours in a sand-bath. A white powder remained, which, dissolved in water, did not give the slightest acid reaction. It must not be forgotten that pepsin loses, by the action of an elevated temperature, some of its property of favoring digestion; but as it was not altered by it in its chemical constitution, I did not hesitate to avail myself of the substance, thus purified, for the elementary analysis.

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* *Journal de Pharmacie.*

† *See* The Chemist, No. IX., Sept. 1840.

The quantity of nitrogen was determined by means of the ammoniacal chloride of platinum, according to the method indicated by Varrentrapp and Will.

These analyses with oxide of copper gave the following results:—

I. 0·127 grammes of pepsin gave 0·265 of carbonic acid, and 0·065 of water.

II. 0·242 grammes gave 0·504 of carbonic acid, and 0·124 of water.

III. 0·291 grammes gave 0·607 of carbonic acid, and 0·148 of water.

The result of these three analyses, calculated per cent., gives

	I.	II.	III.
Carbon .	57·896	57·585	57·675
Hydrogen .	5·686	5·651	5·632

To determine the quantity of nitrogen, I made the analysis with 0·147 grammes of pepsin, which gave 0·489 grammes of ammoniacal chloride of platinum, which, calculated per cent. corresponds to 21·088 of nitrogen.

Taking the mean of the results of the analyses, pepsine is composed of

Carbon . .	57·718
Hydrogen . .	5·666
Nitrogen . .	21·088
Oxygen . .	16·064
	100·530

From these analyses it is evident that pepsin is not identical with modified albumen, as has been supposed.

Pure pepsin is of a yellowish white color; dissolved in water, it has a peculiar animal odor, and a disagreeable taste; it does not become moist in the air.

The combination of pepsin with hydrochloric acid, and its mode of acting with regard to the alkalis, have already been sufficiently pointed out by Warmann.

To form the compound of pepsin with nitric acid, I precipitated pepsin from its solution in water by the protonitrate of mercury. After having decomposed the precipitate by sulphuretted hydrogen gas, the pepsin was precipitated by means of alcohol under the form of a yellowish powder. This powder had a weak acid reaction, and differed from pure pepsin containing acetic acid, in having a stronger specific odor, when dissolved in water. It differs from it more essentially in the property of completely liquefying in the air. The absorption of humidity from the air takes place so rapidly, that it is impossible to keep it dry in the air for more than half an hour, which prevents it from being accurately analysed.

I also examined pepsin with relation to its property of favoring digestion.

It is well known that hydrochloric acid, almost boiling, dissolves albumen in nearly the same manner as pepsin raised to a temperature of 25° C. The action of pepsin appears, therefore, to be analogous to that of an elevated temperature, which could not be produced naturally in the stomach. The acid is, consequently, the solvent of the aliments, whilst the pepsin serves only to dispose for solubility substances previously insoluble, as has already been admitted by Berzelius. The action of pepsin in digestion might thus be compared to the *modus operandi* of diastase, which changes fecula into grape sugar without undergoing any alteration itself.

The following experiment seems to support this *modus operandi:*—2 grains of pepsin dissolved in dilute hydrochloric acid were put in contact with some pieces of cooked beef, at a temperature of 28° C. At the end of a few hours, the meat became transparent at the edges, and some time afterwards it was entirely dissolved. I added to it fresh portions of meat, until they remained undissolved. After having treated the mass with water, I precipitated, by means of a solution of acetate of lead. The precipitate was decomposed by sulphuretted hydrogen, and the filtered liquid was evaporated to a syrupy consistence. I precipitated, with alcohol, 1·98 grains of pepsin, which had not lost its property of producing digestion.

The diminution of weight of the quantity of pepsin employed, from 2 grains to 1·98, is so small that it may be regarded as nothing.

As the entire quantity of pepsin employed for this experiment may be recovered, and new digestions reproduced with it, this result proves, in my opinion, that pepsin serves only for disposing aliments to solubility, without undergoing any alteration itself.

As, according to the state of things, it is scarcely to be doubted that pepsin may be regarded as the principle of digestion, it may be asked if it is not possible to apply this substance to medicine; but experiments made, at my suggestion, by a practitioner in Munich, have not as yet given satisfactory results.

I extracted pepsin from the human stomach. For this purpose, I treated by water the stomachs of two persons who died in the hospital at Munich, thirty-six hours after death. The precipitate formed by acetate of lead was much less in quantity than that obtained from the stomach of one pig. While I extracted from one pig's stomach, treated with water and acetate of lead, a precipitate of 180 to 200 grains, the precipitate from two human stomachs weighed only from 27 to 29 grains. This last precipitate, diluted with water, decomposed by sulphuretted hydrogen gas, and the liquid evaporated to a syrupy consistence, was scarcely rendered turbid by alcohol. The pepsin extracted from the two human stomachs was too small in quantity for its weight to be ascertained; a single pig's stomach, on the contrary, gave at least four or five grains of pepsin. It would seem from this, that the quantity of pepsin is diminished by disease. It may be objected, that in these two human stomachs the pepsin was decomposed by putrefaction; but I exposed to the air for two days two stomachs of pigs, and afterwards extracted from them about two grains of pepsin.

The pepsin extracted from the stomach of a sheep possessed the property of favoring digestion only in a slight degree; it was of a lighter color, and had not the peculiar odor of pepsin.

Water, which had remained in a sheep's stomach for two days, gave, by acetate of lead, a precipitate which weighed 124·93 grains, containing, per cent., 40·328 grains of oxide of lead. Alcohol precipitated from it 2·7 grains of pepsin.

As it would be interesting to examine the pepsin of the stomachs of other animals, I intend to continue my experiments in this respect.

ACTION OF WATER ON THE SULPHURETS OF THE ALKALINE METALS AND THE HALOID SALTS.*

BY HEINRICH ROSE.

Do the sulphurets of the alkaline metals decompose water during their solution in that liquid? This question is more difficult to decide than that relative to the metals of the alkaline earths. (*See* THE CHEMIST, Vol. III., First Series, page 341.) If, however, they do not dissolve in water without decomposition in water, this decomposition is operated in a different manner from what has hitherto generally been admitted; hydrosulphates of the alkalis are not formed, but a hydrosulphuret with free alkali. It is not possible to prove, by direct experiments, that it is really so, since these two bodies are equally soluble in water and alcohol.

Certain properties of the solution of simple sulphuret of potassium alone can lead to the conclusion that it is decomposed in the treatment by water. Such is the alkaline reaction of this solution with litmus paper, which those of the chloride, bromide, and iodide of potassium do not present; such, also, is the fact announced by M. Berthier, that the simple sulphuret of potassium presents a considerable development of heat during its dissolution in water.

As to the combinations of fluorine, it cannot be denied that this body is almost as capable of forming compounds which may be called fluo-salts, as sulphur is of forming sulpho-salts. Fluoride of silicium, fluoboron, and other powerfully electro-negative compounds of fluorine, form with the basic metallic fluorides series of crystallisable salts, so numerous and so well marked, that we may, indeed, find in them the same variety as in the combinations of the highly electro-negative sulphurets with the basic metallic sulphurets. We owe, as is known, to M. Berzelius, the preparation and profound examination of the most important compounds of those two great classes of salts, the sulpho-salts and those which may be called fluo-salts. It is only the great resemblance existing in other respects between the combinations of fluorine and chlorine, which has caused the combinations which may be termed fluo-salts to be regarded as double haloïd salts.

As the sulphurets of the alkaline metals form hydrosulphurets with sulphuretted hydrogen, so do the fluorides of the alkaline earths combine with fluoruretted hydrogen; but during the solution of the fluorides of the alkaline metals in water, are the latter decomposed into similar combinations and an alkali? It certainly is difficult to decide this, because, if it really were so, a fluoride of the alkaline metal would be very easily formed again. All the experiments which I have made positively prove that it is not possible to obtain these combinations with fluoride of potassium by solution in water. Some properties noticed by Berzelius in the alkaline metallic fluorides alone lead us to the supposition, which, however, is very distant, that they are nevertheless capable, under certain circumstances, of undergoing the above-mentioned decomposition. Such is, besides the alkaline reaction of the solution of fluoride of potassium with litmus paper, its property of powerfully attacking glass, and also the easy decomposition, by evaporation of dissolved fluoride of ammonium into ammonia which is volatilised, and into a compound of fluoride of ammonium and fluoruretted hydrogen.

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* *Journal für Praktische Chemie.*

The decomposition of water by the fluorides of the alkaline metals can now, however, be presented only as a very distant and hazarded hypothesis. But should it be confirmed, they will decompose water in the same manner as the sulphurets of the metals of the alkaline earths—a decomposition which is operated in a very different way from what has hitherto been supposed, and which is determined by the tendency of these combinations to form sulpho-salts and fluo-salts.

We do not find a similar tendency in the metallic chlorides. The action of water on the latter does not produce combinations similar to those formed by the soluble metallic sulphurets, and which might, perhaps, also form fluorides of the same nature. With relation to the action of water on the metallic chlorides, it is required only to know whether they are dissolved without decomposition, or whether they are decomposed into hydrochlorates of oxides.

The discussion on this subject is as old as the opinion expressed by Davy, Gay-Lussac, and Thénard, that chlorine is a simple body: but it has not been completely exhausted in favor of any opinion. It has since occupied but little of the attention of chemists, because the question could not be resolved. It has also lost interest in proportion as we have become convinced of the great imperfection of our knowledge concerning the state of saline compounds in general in aqueous solutions.

The most zealous partisans of the opinion that the combinations of chlorine may be dissolved without decomposition in water, must allow that it is not so with all of them. All chemists are certainly of opinion that the very volatile chlorides, especially such as those of phosphorus, boron, silicon, decompose water and form an oxacid and hydrochloric acid.

It is generally admitted, without the facts having been positively enunciated, and without fixing rigorous limits, that all the chlorides which correspond to energetic oxides, and forming acids, decompose water during their solution in that liquid. The discussion extends only to the metallic chlorides which correspond to basic oxides.

The above-mentioned volatile chlorides, even when they are in the solid state, such as the solid chloride of phosphorus, corresponding to phosphoric acid, produce in their decomposition by water a very considerable elevation of temperature. In some cases, not often, however, the increase of temperature may be attributed, in some measure, to the circumstance that a few of the chlorides of a fluid nature form a solid hydrate with a small quantity of water; such is the case with chloride of tin; but among most other volatile and fluid chlorides no similar solid hydrate is known, nor does any exist.

This elevation of temperature can, therefore, be attributed only to the circumstances that the elements of the chlorides alluded to form combinations with those of water. Every chemical combination is accompanied by heat, and the rise of temperature is so much the more considerable as this combination is operated with more energy.

The elevation of temperature is, as I have said, so considerable, that it is impossible, in the decomposition of the solid chloride of phosphorus by water, to remark the cooling which the passage of the solid body to the liquid state must necessarily produce.

If, then, we observe an increase of temperature during the solution of a metallic chloride in water, we may conclude that the elements of the latter have decomposed the former, and that new chemical compounds are formed. It is especially thus when the metallic chloride is in the solid state.

If we observe, on the contrary, a diminution of temperature during the solution of a solid metallic chloride in water, it is because, in this case, no chemical compounds are formed; at least, the water is not then decomposed. The compound formed by the simple solution is so weak, at all events, that, if it should really produce an elevation of temperature, it is concealed by the cooling produced by the passage of the solid body to the liquid state.

The chlorides of potassium, sodium, and ammonium, dissolve in water, producing cold; we may, therefore, rightly conclude that these chlorides are not capable of decomposing water.

But there here arises a circumstance which, in many cases, renders the application of this method, if not impossible, at least difficult. Many solid metallic chlorides which certainly are not capable of decomposing water, often develope much heat in their solution—chloride of calcium for example; and Thénard and Gay-Lussac have attached importance to this property, in this sense,—that they consider the decomposition of this salt by water as demonstrated by this fact. But in this case the metallic chlorides combine with water of crystallisation, and the increase of temperature arises from the absorption of this latter, which passes from the liquid to the solid state; consequently from the same cause that makes the anhydrous oxisalts evolve heat, when they acquire water of crystallisation.

The non-hydrated metallic chlorides, which present in their solution an abatement of temperature, partake this property with the oxysalts which, like the former, are not in a state to take up water of crystallisation. I have found cold to be produced in dissolving sulphate of potassa, sulphate of oxide of ammonia, chlorate of potassa, chromate and bichromate of potassa, nitrate of lead, nitrate of soda, and nitrate of potassa.

There is, however, a considerable difference in the solution of these salts. Those named in the first place, produce, in this case, only a slight diminution of temperature, whilst it was very considerable in the solution of nitrate of soda and nitrate of potassa. The greater or less solubility in water may be partly the cause of this difference; but it is not the only one, since chlorate of potassa produces, during its solution in water, a more considerable abatement of temperature than sulphate of oxide of ammonium, and chlorate of potassa, although the latter salts are more soluble, at the ordinary temperature, than the former.

There exists a similar, but still more marked difference, with the non-hydrated metallic chlorides; but we may, perhaps, find an explanation of the anomaly in the manner in which these chlorides act during their solution in water. Of all the salts which I have had occasion to try, the chloride of ammonium produces the most intense cold. The chloride of potassium also produces a considerable abatement of temperature, but much less than the chloride of ammonium. This diminution is very slight during the solution of chloride of sodium.

The reason of this phenomenon is evidently that the chloride of sodium can, doubtless, in certain circumstances, acquire water of crystallisation. We know that it crystallises at a low temperature with 4 atoms of water, but that the affinity of chloride of sodium for water of crystallisation is so weak that the hydrated salt can exist only at a low temperature. However, this affinity for water of crystallisation, weak as it may be, is the cause of its producing only a slight cooling instead of the considerable diminution of temperature which the solution of chloride of sodium would produce, if, like the chloride of ammonium, it could not take water of crystallisation under any circumstances.

Similar causes also exist, probably in the solution of the oxysalts. If, then, with a salt hitherto known only in the non-hydrated state, only a very slight abatement of temperature is produced during its solution in water, especially if it is very soluble, we have reason for presuming that it has nevertheless a certain affinity for a definite quantity of water, and that it might be crystallised in the hydrated state in circumstances which we have not yet produced.

The non-hydrated oxysalts act with water, absolutely like other salts which have taken up all the water of crystallisation with which they can combine. They present an abatement of temperature, while, if they are treated in the anhydrous state by water, there is a production of heat. It is thus that the carbonate of soda dissolves in water, giving rise to cold if it is crystallized, and to heat if it is anhydrous.

The metallic chlorides which do not decompose water, have the greatest resemblance to the oxysalts whose composition corresponds to theirs, in this sense,—that they also present an abatement of temperature during their solution in water, when they are combined with water of crystallisation. Crystallised chloride of calcium developes cold during its solution, although, when anhydrous, it presents considerable heat.

This great analogy between the oxysalts and the metallic chlorides, which correspond to one another in the anhydrous and hydrated states, is worthy of remark. It might also lead to the opinion of Davy and Dulong relative to the composition of the oxysalts being preferred to that now admitted,—an opinion which has gained additional probability from Mr. Daniell's investigations.

Among the combinations of chlorine which decompose water during solution, there are some which, as I have said above, may combine with water to form a solid hydrate; such is, for example, the chloride of tin. If the hydrate of this latter be dissolved in water, an abatement of temperature is occasioned; whilst considerable heat is produced, as is known, by the treatment of the anhydrous chloride of tin with water. This is a proof that the hydrate is formed of hydrochlorate of oxide.

The very strict limits between the metallic chlorides which decompose water and those which have not this property may easily be traced, as results from the following considerations:—

The salts of certain oxides, such as those of the oxides of antimony and bismuth, and deutoxide of mercury, are, as is known, decomposed by water; the latter may separate from them a basic salt, or, sometimes, pure oxide. This property is evidently owing, as I showed some time ago, (see "The Chemist," Vol. II. p. 333, for a very interesting paper by H. Rose, *On the Salts of the Protoxide of Mercury*,) to water having the property, in these cases, of acting as a base and of eliminating these oxides, because they are weaker bases than water, at least with regard to certain acids.

The combinations of chlorine with antimony and bismuth, whose composition is analogous to that of the oxides of these two metals, act with water in the same way as the oxysalts which correspond to them. It is a natural consequence of this fact, that water first converts them into hydrochloric acid and oxide, and a greater quantity of water separates the latter. Indeed, these chlorides are also of the number of those which, notwithstanding their solid state, present, in the treatment by water, a very considerable developement of heat.

The salts of deutoxide of mercury, like those of antimony and bismuth, are decomposed by water; but the chloride whose composition is analogous to that of deutoxide of mercury does not allow of the precipitation of oxide nor the formation of a basic salt, even by an elevation of temperature. Now, chloride of mercury is no more decomposed by water; as it is at the same time incapable of taking up water of crystallisation, it produces, in its treatment by water, an abatement of temperature, which is slight, however, on account of the sparing solubility of the chloride in cold water.

Considerations similar to those which I have presented relative to the action of water on the metallic chlorides may be applied to the metallic bromides and iodides, as well as to the sulphocyanurets, when they are treated by water. Those of these compounds whose composition corresponds to that of the basic oxides are dissolved in water, without decomposition; they also produce, when they cannot take up water of crystallisation, an abatement of temperature during solution, like the corresponding compounds of chlorine. I have observed it during the solution of bromide and iodide of potassium as well as during that of the sulphocyanuret and cyanuret of the same metal, which, consequently, dissolve in water without decomposition. The fact of this latter body being afterwards decomposed in this solution with so much facility, is independent of the considerations in question.

On the contrary, fused fluoride of potassium dissolves in water with an elevation of temperature. In seeking for the cause of this phenomenon, I found that this body takes up water of crystallisation, with four atoms of which it may be crystallised.

The considerable developement of heat presented, according to Berthier, by the simple sulphuret of potassium during its solution in water, is, in my opinion, as I have already stated, a proof of its decomposition by water; since we do not know any combination of sulphuret of potassium with water of crystallisation, such as may exist, according to Berzelius, with the sulphuret of sodium. The sulphuret of barium also presents a considerable elevation of temperature, when a small quantity of water is poured on to it. But in this case hydrated sulphuret of barium is formed, which a greater quantity of water decomposes in the manner before noticed.—(See "The Chemist," Vol. III. page 340.)

ON THE NEUTRAL NITROGENOUS MATTERS OF ORGANISATION.*

BY MM. DUMAS AND CAHOURS.

Chemists have for a long time observed, in animals, neutral nitrogenous matters, remarkable for a great number of common properties,—for their abundance in the solids and fluids of the economy, and for their presence in all our essential aliments: these matters are albumen, fibrin, and caseïn. Albumen, which constitutes the substance of white of egg; fibrin, which forms the coagulable portion of the blood; and caseïn, which forms the animal part of milk. Recently every one has agreed in attributing to them an identical composition.

In an *Essay on Chemical Physiology*, published about eight months ago, M. Boussingault and I (Dumas) laid it down as a principle that these albuminoïd matters exist in plants; that they pass, perfectly formed, into the body of herbivorous animals, from which they are transported into that of carnivorous animals; that plants alone possess the power of generating these products, which animals take from them to assimilate or destroy them, according to the wants of their existence.

We had extended these principles to the formation of fatty matters, which, in our opinion, are completely produced in plants, and which act, in animals, the part of combustibles, or even, sometimes, a transitory part.

We had, indeed, recognised the necessity of grouping together all the bodies of organic chemistry possessing the property of passing to the state of lactic acid by fermentation, entering like sugar and fecula, into an important part in the nourishment of man and animals, being really produced only in plants, by the forces of vegetation.

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* Read at the Sitting of the Royal Academy of Sciences, Paris, Nov. 28, 1842.

We have collected and summed up our views and their consequences in the following table :—

THE VEGETABLE	THE ANIMAL
Produces neutral nitrogenous matters ;	Consumes neutral nitrogenous matters ;
——— fatty matters ;	——— fatty matters ;
——— sugars, feculas and gums ;	——— sugars, feculas and gums ;
Decomposes carbonic acid ;	Produces carbonic acid ;
——— water ;	——— water ;
——— ammoniacal salts ;	——— ammoniacal salts ;
Disengages oxygen ;	Consumes oxygen ;
Absorbs heat ;	Produces heat ;
——— electricity ;	——— electricity ;
Is an apparatus of reduction ;	Is an apparatus of oxidation ;
Is immovable.	Is locomotive.

Although these laws relate to a certain number of facts or principles already known, they constitute, collectively, a system which we have a right to regard as new.

On its appearance, this system became an object of so much attention as to encourage us vigorously to follow up its experimental development.

The accurate demonstration of the laws which we laid down required a great number of very delicate analyses. The absence of M. Boussingault, who was completing, in Alsatia, some experiments commenced a long time ago, having deprived me of his assistance, and being unable to execute by myself all the analyses which we had in view, I was fortunate enough to find in the assistance of M. Cahours, formerly a pupil at the Polytechnic School, all that I desired.

Notwithstanding all the zeal with which we worked, we should have had some difficulty in bringing to an end a work requiring more than five hundred organic analyses,—made by longer processes than are commonly employed, but also, we think, more accurate, and here accuracy was especially an object,—if our labor had not been considerably alleviated by the devotion of M. Saint-Evre, a young and enlightened chemist, who applied himself with ardor to the task, and took on himself a great portion of it. We beg him to accept our public thanks.

If, as we hope, physiologists recognise, with us, that plants are charged with generating the proteïn which serves as a base for albumen, fibrin and caseïn ; that animals modify, assimilate or destroy this matter, but that they do not create it ; we shall deem ourselves happy, after having been the first to publish these opinions, in being also the first to furnish to science accurate analyses of some of these substances.

We may mention, however, to avoid any misunderstanding, that, as regards albumen, this opinion has already been published by Prévost and Le Royer, in their Memoir on Digestion ; but, we must say, it was not supported by sufficient proofs to convince physiologists.*

It was subsequently adopted by Mulder, who, relying simply on the identity of composition which he had recognised between vegetable and animal albumen, unhesitatingly concluded that the albumen of herbivorous animals arises from the plants on which they feed.†

A granivorous bird finds in corn all the elements of its nutrition. In bread, a dog meets with the matters which his organisation requires for living and developing itself. A mare which is giving suck may not only find in barley and hay the materials necessary to its own existence, but also the substance by means of which the caseïn found in milk is formed.

Cereals must, then, independently of the amylaceous matters which they contain, present to animal organisation the means of procuring the neutral nitrogenous substances which every animal contains, and which we deny it the power of generating.

Nothing is more conclusive, in this respect, than the analysis of corn or that of the farina which arises from it.

If we take some farina, and, after having formed of it a firm paste, slowly wash it under water, every one knows that there remains on the hand of the operator, a greyish, elastic, tenacious paste, with an insipid odor, which constitutes the gluten of former chemists. The turbid liquor which flows out takes with it the fecula and any remaining gluten, and it contains all the soluble products.

Now if, after having left this liquor to settle, it be decanted so as to obtain it clear, and free from fecula, it is sufficient to boil it to see that scums are formed which contract under the form of greyish fibres and presentnig all the characters of coagulated albumen.

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* *Annales des Sciences Naturelles*, t. v.

† *Repertoire de Chimie.*

Again, in crude gluten, such as remains on the hand of the operator, after abundant washings, the presence of at least four distinct substances may easily be recognised.

Indeed, if it be boiled first with concentrated, and afterwards with dilute alcohol, a fibrous, greyish result is obtained, which one of us, in his lecures of 1839, designated vegetable fibrin.

The alcoholic liquors, left to cool, give a product to which we are led to attribute properties by which caseum or caseïn are ordinarily characterised.

Finally, if these alcoholic liquors be concentrated and allowed to cool, a pultaceous substance is deposited, which presents all the properties of albuminous matters, but which, from the speciality of some of its characters, will more particularly merit the name of glutin.

With the glutin is likewise precipitated a fatty matter, easily extracted by ether, and which presents all the properties of ordinary fat oils, or of butyrous matters, which it resembles in its fusing point.

Thus, the analysis of the farina of cereals furnished to us:—

1st. Albumen.
2nd. Fibrin.
3rd. Caseïn.
4th. Glutin.
5th. Fatty matters.

6th. Fecula, dextrin, and glucose.

We regard it as demonstrated that all the aliment of animals contains, if not all the first four substances,—that is to say, all the neutral nitrogenous matters,—at least some of them.

We admit that, in the case in which starch, sugar and dextrin do not appear in the food, they are replaced by fatty matters, as is seen in the alimentation of carnivorous animals.

It is evident that the association of neutral nitrogenous matters, with fatty and saccharine or feculent matters, constitutes almost the whole of the aliments of herbivorous animals.

From the above, may not two fundamental principles of alimentation be deduced? namely:—

1. That neutral nitrogenous matters are an indispensable element of the nutrition of animals:

2. That, on the contrary, animals may, to a certain extent, do without fatty matters; that they may absolutely do without feculent or saccharine matter, but on condition that the fatty matters are replaced by proportional quantities of fecula or sugar, and *vice versâ*. We shall see further on that, if the absence of fatty matters does not compromise, for a time, the life of the animal, it nevertheless exerts an effect which merits particular attention.

The indispensable necessity for all animals to take into their system the neutral nitrogenous matters which exist in their own organisation, is almost sufficient of itself to show that they are incapable of generating these matters. But, to put this result in full evidence, it is sufficient to follow these neutral nitrogenous matters introduced into the stomach, and to see what is their final destination. Now, it is easy to prove that they are found essentially represented by urea, which, in man and herbivorous animals, constitutes the powerful product of urine, and by uric acid, which, in birds and reptiles, acts the same as urea.

Abstraction being made of the excrements, the adult man absorbs, every day, a quantity of neutral nitrogenous matters representing from 15 to 16 grammes of nitrogen, which quantity is found entire in the 30 or 32 grammes of urea which he passes in the 24 hours.

Thus, abstraction being made of all the phenomena which take place in the interior of the organs, and considering only the balance of nutrition and excretion, it is found that man gives out in urea nearly all the nitrogen which he receives, under the form of neutral nitrogenous matter.

Is it not very simple to conclude from this that the neutral nitrogenous matter of our food serves for producing this urea, and that the whole operation of animal organism is limited, either to assimilating this neutral nitrogenous matter when it requires it, or to converting it into urea?

This opinion becomes almost evidence, if we add that the study of the phenomena of respiration shows us that the fatty matters disappear from the animal organism by the effect of a true combustion; that the amylaceous or saccharine matters are equally burned in the accomplishment of the phenomena of life; and, finally, that the difference which exists between urea and the neutral animal matter from which it is derived, are exactly represented by a phenomenon of combustion.

It was with the view of verifying, controlling, and limiting to truth these conclusions relative to neutral nitrogenous matters, that the following experiments were undertaken.

FIBRIN.

It has hitherto generally been admitted that fibrin is identical, as to composition, with albumen. Mulder has presented such a number of analyses that lead to this conclusion, that it is matter of no astonishment that Liebig and his pupils should have fallen into the same error.

Indeed, it requires great attention to perceive that fibrin differs, in composition, from albumen, as that difference is slight; but it is indubitable; and fibrin, unquestionably, contains more nitrogen and less carbon than albumen.

This excess of nitrogen is not so great as is supposed by Gay-Lussac and Thénard, whose analysis, with respect to the carbon and hydrogen, is irreproachable.

We have taken great pains to give our analyses all the accuracy of which the present state of science admits. The matters were purified and dried with minute precautions, the necessity for which will immediately be recognised by those who devote themselves to the study of products of this kind.

The analysis was always directed in such a way as to estimate every matter in an absolute manner, and with an approximation sufficient for putting in evidence the slight differences which we had to appreciate.

Thus, when it was required to estimate nitrogen, we operated in such a manner as to collect at least 50 or 60 cubic centimetres of this gas, and often 80 or 100 cubic centimetres. Hence, the differences, which were too slight to be manifested in small quantities, became sensible and measurable.

For hydrogen and carbon, we always employed the known process with oxide of copper, but we invariably used chlorate of potassa at the end of the analyses, either as a means of terminating the combustions, or as a means of removing the carbonic acid and water from the apparatus without the intervention of atmospheric humidity, which it is so difficult to avoid by any other means.

The greatest difficulty to be overcome in the analysis of the matters with which we are occupied, consists in drying them conveniently, and in preventing them from again absorbing water, while they are being bruised with the oxide of copper. By reducing them to a fine powder, and by prolonging the stay of the powder, at 140°C., *in vacuo*, their desiccation is insured; and, by very quickly mixing them with oxide of copper heated to 100°, their hygrometric action is as far as possible avoided.

MEAN OF THE ANALYSES OF FIBRIN.

	Of Blood of the					Fibrin of			
	Sheep.	Calf.	Ox.	Horse.	Dog.	Dog fed 10 Weeks with Meat.	Dog fed 10 Weeks with Bread.	Blood of Man.	Of Farina
Carbon . .	52·8	52·5	52·7	52·67	52·74	52·77	52·57	52·78	53·23
Hydrogen .	7·0	7·0	7·0	7·00	6·92	6·95	7·07	6·96	7·01
Nitrogen .	16·5	16·5	16·6	16·63	16·72	16·51	16·55	16·78	16·41
Oxygen, &c.	23·7	24·0	23·7	23·70	23·62	23·77	23·81	23·48	23·35
	100·0	100·0	100·0	100·00	100·00	100·00	100·00	100·00	100·00

ALBUMEN.

Albumen is divided into two great varieties: animal albumen, which is always alkaline; and vegetable albumen, which is not ordinarily accompanied by a free alkali.

Animal albumen is almost in the pure state in white of egg and the serum of the blood. It was this that we took for analysis.

Vegetable albumen, or, at least, the substance usually designated by that name, may be extracted from a great number of plants, but we preferred that from farina.

Albumen readily yields sulphur, in appreciable quantity, to potassa. When it is freed from it, its composition is a little changed; we were, consequently, necessitated to bestow great care on analysing it in this new form.

In all the analyses, however, the general plan which we indicated with regard to fibrin was followed.

We should remark, that among the numerous analyses of albumen, that of Gay-Lussac and Thénard appears to us the most accurate. That published by Mulder left nothing more to be desired.

MEAN OF THE ANALYSES OF ALBUMEN.

	Serum of				Albumen of	
	The Sheep.	The Ox.	The Calf.	Man.	White of Egg.	Farina.
Carbon . .	53·54	53·40	53·49	53·32	53·37	53·74
Hydrogen .	7·08	7·20	7·27	7·29	7·10	7·11
Nitrogen . .	15·82	15·70	15·72	15·70	15·77	15·66
Oxygen, &c.	23·56	23·70	23·59	23·69	23·76	23·50
	100·00	100·00	100·00	100·00	100·00	100·00

CASEÏN.

We designate by this name the caseum of milk.

The difficulty of preparing pure caseïn in its soluble form, induced us to pay particular attention to its analysis in the insoluble form. Besides, we consider, from their properties, that those two bodies constitute two varieties, by dimosphism, of the same substance.

The first analyses of caseïn, executed by Gay-Lussac and Thénard, would indicate more carbon and less nitrogen than this substance contains, which evidently arises from the mixture of a little butter in the caseïn which they analysed. Indeed, long digestion in ether is required to entirely extract it.

Since then it has been recognised,—and in this respect the analyses of M. Mulder are irreproachable,—that caseïn does not differ from albumen in elementary composition. Our experiments entirely confirm this result.

MEAN OF THE ANALYSES OF CASEÏN.

	Of the Milk of					Caseïn	
	The Cow.	The Goat.	The Ass.	The Sheep.	Woman.	Of Blood.	Of Farina.
Carbon	53·50	53·60	53·66	53·52	53·47	53·75	53·46
Hydrogen . .	7·05	7·11	7·14	7·07	7·13	7·09	7·13
Nitrogen . . .	15·77	15·78	16·00	15·80	15·83	15·87	16·04
Oxygen, &c. .	23·68	23·51	23·20	23·61	23·57	23·29	23·37
	100·00	100·00	100·00	100·00	100·00	100·00	100·00

GLUTIN.

Among the proximate principles which may be extracted from crude gluten, there is one which is dissolved in boiling alcohol, which does not precipitate by cooling, but separates by evaporation, and which makes the concentrated liquor take the form of a mass when the liquor cools. This is glutin properly so called.

As this matter is always accompanied by a large quantity of fatty matter, it must be dried, powdered, and exhausted by ether, which removes a large portion of the half congealed fat with which it is mixed. It is afterwards exhausted by alcohol and by water. The matter is finally dried at 140° C. *in vacuo*. The following is its analysis:—

Carbon	53·05
Hydrogen	7·17
Nitrogen	15·94
Oxygen, &c. . . .	23·84
	100·00

Glutin is, therefore, isomeric with albumen and caseïn. The history of this substance remains to be given, which is so much the more interesting, as it possesses, like albumen and caseïn, the property of acquiring a violet blue color when dissolved in concentrated hydrochloric acid.

Thus, from its special characters, its presence in wheat, the part which it plays in gluten and panification, from its identity with albumen and caseïn, glutin is one of the most interesting of organic matters. Unfortunately, the gluten of wheat does not furnish much of it. Perhaps other cereals will be found whose farina will yield a greater abundance of purer glutin, fibrin and caseïn being diminished. If this hope be realised, the study of glutin will be so greatly facilitated that we have postponed it until we have completed the comparative examination of different farinas.

PROTEÏN.

In all the preceding analyses, the albuminoïd matter was employed as furnished by nature : there exists, however, a process already used by Mulder, by means of which an organic matter may be obtained free from sulphur and still endowed with all the general properties of albuminoïd substances: this is the proteïn of Mulder.

This process consists in dissolving natural albuminous matter in potassa ; sulphuret of potassium and a solution of the animal matter in the alkali are furnished ; so that by afterward adding to it an acid, a precipitate formed by the animal matter, and a disengagement of sulphuretted hydrogen, are obtained.

We first examined the proteïn extracted from caseïn.

The coagulum obtained by means of vinegar and skimmed milk, washed with distilled water, gave, when treated by a weak solution of potassa, a limpid product, which was separated by filtration. On adding acetic acid to this liquid, a considerable quantity of sulphuretted hydrogen was disengaged, and an abundant flocculent precipitate was formed, which, washed with water and with alcohol, and dissolved in ether, then dried at 140° C. *in vacuo*, gave by analysis the following numbers :—

				Mean.
Carbon . . .	54·27	54·32	,,	54·29
Hydrogen. .	7·11	7·09	,,	7.10
Nitrogen . .	,,	,,	15·94	15·94
Oxygen, &c.	,,	,,	,,	22·67
				100·00

As we attached great importance to these analyses, all imaginable precautions were taken to insure accuracy.

The proteïn extracted from albumen, presented, as will be seen, the same composition as that from caseïn.

Serum was precipitated, by means of alcohol, from bullock's blood. The product being abundantly washed with alcohol, then with water, was redissolved in an aqueous solution of potassa. At the end of a few hours, the liquid having been neutralised by acetic acid, a very abundant precipitate and a very considerable disengagement of sulphuretted hydrogen were obtained. The precipitate, washed in water, in alcohol, and in ether, and dried at 140° C. *in vacuo*, gave the following numbers:—

Carbon	54·38
Hydrogen	7·14
Nitrogen	15·92
Oxygen, &c. . . .	22·56
	100·00

The formula which best represents the composition of this matter is as follows:—

C^{48}	54·44
H^{37}	6·99
N^{12}	15·88
O^{15}	22·69
	100·00

[The completion of this Memoir will be given in our next. We regret being necessitated to divide it, but its length leaves us no alternative.]

ON SOME OF THE PROPERTIES OF FERRIC ACID.

BY REUBEN PHILLIPS.

To ascertain if chlorate of potassa, potash and oxide of iron are capable by fusion of forming a metallic salt, as in the case of manganium, I fused these substances together; a ferrate was evidently formed. Water at the temperature of 60°, when added to it, did not readily decompose it; but when gently heated there was an immediate precipitation of the oxide of iron, at the same time no adequate escape of oxygen gas could be perceived; it immediately occurred to me that possibly the oxygen went over to the chloride of potassium, producing a chlorate, but the filtered fluid showed no conclusive evidences as to the presence of that substance. From a variety of experiments which I need not detail, I at first thought that a perchlorate had been formed.

To arrive at certainty on this point, I performed the following experiments on much larger quantities than those on which I had hitherto operated.

Nearly equivalent quantities of the sesquioxide of iron, chlorate of potassa, and hydrate of potassa, hydrogen = ·5 grain were intimately mixed, by being triturated in a mortar; the mass was then ignited in a porcelain crucible; the substance when cold had a yellowish color, and appeared to contain no sesquioxide of iron, but the addition of water caused the production of that oxide; the superior solution had a fine green color resembling the manganate of potassa; as I wished to effect its entire decomposition, the whole was heated. I had been previously led to suppose that the decomposition would be easily effected; owing perhaps to the concentrated state of the solution, I took its temperature when the depth of color had suffered no appreciable diminution, and found 145° if finally boiled without the decomposition being complete, at which temperature it was for some time maintained. It being evident from the quantity of oxide of iron thrown down, that nearly the whole of the ferrate had been decomposed, I proceeded to neutralize the alkali with sulphuric acid, with which it was supersaturated, the excess being afterwards removed with carbonate of lime; as the saturation proceeded, the solution assumed a rich red color, closely resembling the color of the permanganic acid. The solid matter was isolated by the filter, and the clear fluid evaporated.

In experimenting on the saline mass thus obtained, I was much embarrassed by the chlorous salt not being uniformly mixed with the other two salts, which caused the first portions on which I operated to give hardly any traces of a chlorate; which source of error being guarded against, the following results were obtained: the saline mass discolored hydrochloric acid; about one third of it was placed in a glass retort, connected with a bent tube containing a small quantity of water to absorb any hydrochloric acid which might pass into it; to the substances in the retort sulphuric acid was added; chlorine escaped at the end of the bent tube. Another portion was treated with boiling spirit of wine; the clear solution being decanted and evaporated, left salts, which with sulphuric acid copiously evolved chlorine. From these experiments it follows, that the chlorous salt is a chlorate and not a perchlorate. Whether a chlorate is directly formed by the action of ferrate of potassa on the chloride of potassium, or a lower oxide of chlorine, I must for the present leave undecided.

NEW OXACID OF SULPHUR.*

BY M. M. FORDOS AND GELIS.

It was supposed that iodine added to a hyposulphite, in the presence of water, reacted on it in the same manner as on free or combined sulphurous acid, and formed sulphuric and hydriodic acids; but this is not the case. The hyposulphites absorb a considerable quantity of iodine without producing sulphuric acid; for hyposulphite of baryta, heated by this reagent, gives a transparent liquor, when it has been previously diluted with four or five times its weight of water.

Being desirous of finding out what occurred in this reaction, we first studied it with crystallised hyposulphite of soda, after having analysed it, and having ascertained that the samples on which we were about to operate had the formula $SoO\ S^2\ O^2 + 5\ HO$. We devoted ourselves to experiments, of which the following are the principal results:—

The iodine rapidly dissolved in a solution of hyposulphite, and became yellow only when the saturation was complete. The crystallised salt absorbed rather more than half its weight of dry iodine, and this quantity corresponds to one atom, or half an equivalent of iodine to one equivalent of salt. No free acid was disengaged during the experiment, for the liquor, which was neutral at the commencement of the experiment, remained so at the termination. Neither sulphuric acid, nor any acid capable of precipitating the salts of baryta, was formed. Suphurous acid was not disengaged, and sulphur was not deposited.

As all the sulphur remained in the liquors in a peculiar state, and as, at the same time, an alkaline iodide was found in it, the presence of which it was easy to detect, we at once thought that the iodine had removed half of the sodium from the hyposulphite, and that the oxygen combined with this portion of the metal was added to the remainder of the elements, forming a new acid, analogous to that of M. Langlois, (*see* The Chemist, No. V. p. 136), but containing more sulphur. This reaction might be represented as follows:—

$$2\ (So\ O\ S^2\ O^2) = I^2 = So\ I^2 + So\ O\ S^4\ O^5.$$

A more complete examination of the liquor containing iodine confirmed this hypothesis. When left for a long time to itself, and when heated to ebullition, it was decomposed: it disengaged sulphurous acid; sulphur was precipitated, and sulphuric acid formed. It is evident that this destruction may be compared with that which the acid of M. Langlois undergoes in the same circumstances: all the difference lies in the quantity of sulphur precipitated, which is double that furnished by sulpho-hyposulphuric acid.

There exists, therefore, an acid of sulphur, whose formula is $S^4\ O^5$. This acid, which we will call *bisulphuretted hyposulphuric acid*, completes a curious series of the oxacids of sulphur, in which the quantity of oxygen remains fixed, and that of the sulphur increases as the numbers 2, 3, and 4.

Hyposulphuric acid	$O^5\ S^2$
Sulphuretted hyposulphuric acid .	$O^5\ S^3$
Bisulphuretted hyposulphuric acid .	$O^5\ S^4$

Hyposulphurous acid, being represented by $O^5\ S^5$, might terminate this series, if it did not deviate from it by its capacity of saturation.

These facts, conclusive as they may appear, would have been regarded as insufficient for demonstrating the existence of the acid $S^4\ O^5$, if we had not also been able to isolate it, as well as some of its principal compounds. The property of absorbing half an equivalent of iodine to one equivalent of salt, belongs to all the hyposulphites. Thus, when hyposulphite of lead was treated with iodine, moistened with water, there was likewise an absorption of this metalloid, a yellow crystallised deposit of iodide of lead was formed, and the liquor held in solution *bisulphuretted hyposulphate* of this metal. To obtain the new acid, it was sufficient to pass an excess of hydrosulphuric acid into this liquor, to filter, and to drive off the excess of sulphuretted hydrogen by a current of gas. But as the iodide of lead is rather soluble in water, and as the action of iodine on the hyposulphite is very slow, we used a process which consists in decomposing the salt of baryta by sulphuric acid.

Iodine acts very promptly on hyposulphite of baryta. When it is desired to obtain the bisulphuretted hyposulphite of this base, the hyposulphite must be diluted with very little water. In proportion as the iodine is absorbed, the hyposulphate disappears, because iodide of barium, and the bisulphuretted hyposulphate, both of which are soluble, are formed; but the latter salt, no longer finding sufficient water to dissolve it, very soon precipitates in flocks, which increase more and more, and cause the liquor to become a mass. When the saturation is complete, this mass is treated with concentrated alcohol, which dissolves the excess of iodine employed, and iodide of barium formed, and leaves the bisulphuretted hyposulphate of baryta.

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* *Comptes Rendus*, No. 20, 14th Nov. 1842.

The white powder thus obtained is very soluble in water; it is dissolved in a very small quantity of menstruum, the solution is filtered, and, in a short time, by spontaneous evaporation, fine crystals of bisulphuretted hyposulphate of baryta are obtained.

These crystals may be still more easily obtained by adding alcohol to an aqueous solution.

This salt is easily preserved at the ordinary temperature, but it cannot be heated without being decomposed; and, calcined in a crucible, it yields water, sulphurous acid, and sulphur, which are disengaged, and sulphate of baryta, which remains as a residue.

This salt, as regards its properties, can be compared only with that of M. Langlois, but in analysis they cannot be confounded with one another.

When this salt, dissolved in 100 parts of water, is treated by a current of chlorine, a certain weight of sulphate of baryta is obtained, and the chloruretted liquor, treated by nitrate of baryta, gives three times as much sulphate of baryta as was obtained in the first instance. Finally, the same liquor contains 7 equivalents of hydrochloric acid for 1 equivalent of salt employed, which confirms the formula, $Ba\ O,\ S^4\ O^5$.

We availed ourselves of the bisulphuretted hyposulphate of baryta for preparing almost all the others; it also served us for obtaining the free acid, and we have employed for that purpose the process followed by MM. Gay-Lussac and Walter, for isolating hyposulphuric acid.

Bisulphuretted hyposulphuric acid is scarcely more alterable than hyposulphuric acid; it is possible to make it attain a very high degree of concentration. It is colorless and transparent, and, when boiled, it is decomposed into sulphur, sulphurous acid and sulphuric acid.

Bisulphuretted hyposulphuric acid, free or combined, is not altered by hydrochloric and sulphuric acids. Nitric acid, on the contrary, precipitates sulphur from it.

It does not precipitate the salts of zinc, iron, copper, &c.

It deposits a white precipitate from protochloride of tin and bichloride of mercury.

It gives, with protonitrate of mercury, a yellowish precipitate, which an excess of acid turns black. The precipitate obtained with nitrate of silver is white at first; in a few seconds it turns yellow, and ultimately becomes black.

These characters, with those which we have already pointed out, sufficiently distinguish the acid that we have obtained from all the oxygenous compounds of sulphur hitherto described.

Independently of the interest which the formation of this new acid gives to the reaction of iodine on the hyposulphites, it derives further importance from the application that may be made of it to the analysis of the different oxygenous compounds of sulphur, which presents many difficulties in the present state of science.

Setting out from this reaction, we have discovered a very accurate process of analysis, which has been of great assistance to us in investigations which we shall very shortly have the honor of laying before the Academy.

NEW VOLTAÏC PILE.*

BY C. F. SCHÖNBEIN.

Having made, six years ago, numerous investigations concerning iron, I discovered a series of circumstances in which that metal acquires the property of becoming similar to platinum in its chemical relations. I also found that the manner in which iron acts in a voltaïc point of view, when it is in this extraordinary state, very much resembles the mode in which platinum acts; that is to say, speaking in the language of physics, that iron in this anomalous state is very negative with regard to all the oxidisable metals, and in particular with regard to ordinary iron. I gave the name of *passivity* to the property which this metal possesses of being indifferent with regard to oxygen in the circumstances in question. I had already constructed with iron rendered passive and ordinary iron, small piles, very energetic, considering their size, and which I set in operation before the Natural History Society of Bâle. Other occupations having prevented me from further prosecuting this subject, it was resumed by Mr. Hawkins, and simultaneously also by Mr. Roberts, and they were the first who constructed larger piles in which the iron acted as the negative metal.

At a more recent period, Wöhler and Poggendorff also occupied themselves with this subject, and entirely confirmed the results which I had obtained.

Finally, I last year resumed the question myself, and being in want of a very powerful pile for continuing my investigations concerning the electrical odor, I tried, from economical motives, to substitute iron for the platinum which is necessary for Grove's apparatus. The following will show how far success attended my efforts :—

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* *Archives de l'Electricité*, No. 5, 1842. Edited by Professor De la Rive.

I commenced by uniting into one pile of five pairs, five hollow cylinders of cast iron with an equal number of hollow cylinders of amalgamated zinc. Each iron cylinder was, in the interior, 10 inches high, 3 inches 9 lines in diameter; and each zinc cylinder was 9 inches 9 lines high, and 3 inches 3 lines in diameter. Into each of the former, I introduced a cylinder of porous clay, being 10 inches high and 3 inches 4½ lines in diameter, and between both a mixture formed of three parts of nitric acid, at 37° Reaumur, and one part of ordinary sulphuric acid; then I poured into the cylinder of clay destined for receiving the zinc cylinder, sulphuric acid diluted with 12 times its volume of water. On afterwards passing the current from this pile through water, containing a twelfth part of its weight of sulphuric acid, there was disengaged on the platinum electrodes of the apparatus 40 cubic inches of detonating gas per minute, or 2400 per hour, which is very considerable.

After these data concerning the power of chemical decomposition which this pile possesses, I scarcely need to say that the effects, whether magnetic or calorific, which were obtained, were likewise of a surprising energy.

As to the first of these effects, an idea may be formed when it is known that the current of a single pair of my pile, in passing through the spiral copper wire with which a piece of iron in the form of a horseshoe was surrounded, developed so much magnetism that the arming of the electro-magnet did not yield to the weight of four quintals, the heaviest weight I could arrange. Four elements imparted rapid motion to a very large electro-magnetic machine, constructed by Mr. Eglin, mechanician at Bâle, and a pile of ten pairs gave rise to truly astonishing magneto-electric effects. Indeed, the experiments of combustion with metals and charcoal have been also more brilliant than I have ever seen.

As the employment of zinc in the pile presents every kind of inconvenience, and the price of this metal being no longer unimportant, I thought that it would be desirable to replace it by another metal, recommended by cheapness, without presenting the other inconveniences. Now, my experiments have shown me that iron is precisely the body that I sought for, and that voltaïc piles, as powerful and as active as it is possible to desire, may be constructed with passive iron and active iron. As I reserve myself hereafter to describe more in detail, in the *Archives*, this new kind of voltaïc pile, I will at present confine myself to observing, that a pair formed of a single cylinder of iron, of the above-mentioned dimensions, and of a hollow cylinder of cast iron, and similar in other respects to a pair of zinc and iron, gave a current of extraordinary energy. The *arming* of the electro-magnet, produced by the current of this pair, could sustain a weight of four quintals. Moreover, two small cylinders of leaf iron, only a few inches round, and which were steeped in a mixture of nitric and sulphuric acid, and in dilute sulphuric acid, or in hydrochloric acid, gave rise to an electro-magnet, which, in certain circumstances, could support one quintal.

Nitric acid, as pure and concentrated as possible, renders iron passive by simple contact, and that metal may remain steeped in it without being in any way attacked, if it plays the part of the electro-negative element of a pile; this liquid being, besides, a good conductor of the current; consequently, that with which the external iron cylinder is surrounded, must be unmixed and concentrated, if we desire to obtain with the pile in question the greatest effects of the current. I found, however, that with a mixture of two parts of nitric acid of 1·4, and one of ordinary sulphuric acid, results very similar to those given by the most concentrated pure nitric acid may be obtained. Some preliminary experiments have shown me that, even with a mixture of four parts of sulphuric acid and one part of nitric acid, extremely favorable effects of the current are still obtained. Thus, economy, and other advantages, would induce me to use, for charging the pile, this mixture, rather than pure concentrated acid.

For my part, I have never formed very brilliant expectations relative to the practical application of electro-magnetism as a motive power; if, however, we should one day attain this object, to which the efforts of so many philosophers are directed, I believe that the pile of iron will bring us a step nearer to it. Indeed, not only may this pile be constructed at less expense than any other voltaïc apparatus with which I am acquainted; but also,—and this is well worth attention,—the salt of iron which is formed in my apparatus is of much more extensive employment in the industrial arts than the sulphate of zinc at present obtained in piles.

ON CHEMICAL EQUIVALENTS CONSIDERED AS SIMPLE MULTIPLES OF HYDROGEN.*

BY J. PELOUZE.

The attention of chemists has recently been attracted to the hypothesis of Dr. Prout, which consists in regarding the equivalents of all bodies, without exception, as entire multiples of that of hydrogen. For a long time this hypothesis found few partisans except in England. Almost every one agreed in looking on this question as a natural consequence of the low proportional number of hydrogen as compared with all other bodies, which inferiority is such that, except corrections most frequently insignificant, like every other small quantity, it must be contained an entire number of times in a great number.

The new determinations of the equivalents of carbon, hydrogen, nitrogen and calcium, so carefully made by Dumas, tend to reduce the hypothesis of the English chemist to a true law. There are simple numerical relations between these last equivalents, as may immediately be deduced,—apart from all theoretical view,—from Dumas's numerous experiments. I am far from denying the accuracy of any of the results which have served as a basis for the rectification to which several equivalents have recently been subjected, but I think that the following observations and facts will be sufficient to show that a serious error has been committed, in giving to these relations a character of generality which they do not possess.

The method which I have employed for arriving at the very delicate solution of this question, does not consist in determining, *de novo*, the proportional number of some simple bodies for comparison with that of hydrogen, for this important point of science has been the subject of numerous works on the part of chemists the most skilful in analysis, and Berzelius in particular; and besides, whatever care may be taken in determinations of this nature, they almost all present a certain connection which is sufficient for an error committed with respect to one equivalent to affect several others.

To arrive at the end which I proposed to myself, I devised a series of infinitely more simple and accurate experiments, which consisted in taking well defined oxygenous compounds, susceptible of undergoing an easy decomposition by the sole action of heat, without the intervention of any foreign body, and in determining the quantity of oxygen which these compounds lost, by the weight of their fixed residue, so that, in a word, the whole experiment consisted only in twice weighing and one calcination.

One of the bodies best adapted for this experiment, as being formed of two light equivalents, and as it may be obtained perfectly pure, is the chlorate of potassa.

Heat decomposes it into oxygen and chloride of potassium. Without regarding the respective equivalents of the chlorine and potassium, that of their combination alone may occupy attention: this is evidently the quantity which unites with 600 parts of oxygen, for the chlorate of potassa is formed of six equivalents of the latter body, and of one of each of the other two.

Now, if chlorine and potassium are both simple multiples of hydrogen, the product of their union would necessarily be the same.

The question is, therefore, greatly simplified. It is only required further to know to what limit the errors of the experiment may amount, and to compare the results which it furnishes with the theoretical numbers based on Prout's hypothesis.

100 parts of chlorate of potassa give, according to Berzelius, 39·150 of oxygen, and leave 60·850 of chloride of potassium.

The results of the new experiments of M. Marignac are almost precisely the same,* for he found 39·161 of oxygen, and 60·839 of chloride of potassium, as the mean of six experiments made on very large quantities of the chlorate, and in which the greatest difference was 9 milligrammes of oxygen in 100 grammes of the salt.

I arrived at a similar result: 100 parts of chlorate of potassa yielded me

I. 60·843
II. 60·857
III. 60·830

of chloride of potassium, or a mean of 60·840 [60·843 ?] and consequently 39·160 of oxygen.

The equivalent of these three series of experiments is,

I. 932·560 (Berzelius)
II. 932·140 (Marignac)
III. 932·175 (my experiments)

Mean. . . 932·295

The last number, divided by 12·5, gives 74·583.

Thus, the equivalent of chloride of potassium is neither 74 nor 76 times that of hydrogen; the true number is 74·583.

The equivalent of hydrogen, multiplied by 75, gives 937·5; multiplied by 74, it gives 925. These numbers differ, as is seen, more than half a hundredth from those which express the equivalent of chloride of potassium deduced, without any hypothesis, from a great number of experiments.

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* *Comptes Rendus*, Nov. 28, 1842.

* *Bibliothéque Universelle de Génève*, 1842.

For this equivalent to be a multiple by 75 of that of hydrogen, it must be admitted that, in an operation which consists, as I before said, of one calcination and two weights, an error of 136 milligrammes in 100 grammes was committed.

In adopting the multiple 74, the error would be greater, for it would amount to 183 milligrammes.

This error does not appear possible, when we see that none of Berzelius's experiments differs more than 4 milligrammes in 100 grammes, and that their accordance with those of M. Marignac and myself may be said to be perfect.

Moreover, the perchlorate of potassa leads to the same results, as also to the same consequences. The equivalent 932·140 represents 46·185 per cent. of oxygen in the first of these salts, and M. Marignac found 46·187. The theoretical equivalents would require 46·043 and 46·376.

The foregoing considerations demonstrate, if I am not deceived, in the most certain manner, that Dr. Prout's hypothesis is unfounded; that is to say, that the equivalents of all bodies are not multiples by entire numbers of that of hydrogen.

It must be understood that, in expressing myself thus, I do not mean to say that the equivalent of no body is a simple multiple of that of hydrogen. I confine myself simply to denying the accuracy of such a relation as regards chlorine and potassium, or, more correctly, for one of those elements, for the experiments on which my reasoning is based, in giving the equivalent of their combination, do not allow the numerical value of each of them in particular to be deduced; which, however, has nothing to do with the question, since, in the hypothesis which I am combating, a compound should be, relative to hydrogen, in the same case as its principal constituents.

ON THE COMBINATIONS OF WATER WITH THE HYDRACIDS.*

BY M. A. BINEAU.

In all the combinations of water with the hydracids, with only one exception, the relation which exists between the water and the acid deviates very much from the ordinary relations; so that, if it be wished to regard these compounds as salts, and to assign to water only the part of a base, they would be extremely basic salts; for, to one proportion of acid, 9, 10, 11, 12, and 16 proportions of base would be found in them.

We have seen, indeed, that hydrochloric, hydrobromic, and hydriodic acids, after concentration by heat, remain united to 16, 10, and 11 equivalents of water; that, concentrated by evaporation at the temperature of the atmosphere, the first retains 12, and the second 9; and, finally, that ioduretted hydriodic acid remains similarly united with 9 equivalents of water, after long boiling.

Boiling renders aqueous hydrofluoric acid quadrihydrated, the same as nitric acid.

The analogy which prevails so habitually among the compounds of chlorine, bromine and iodine is, therefore, but incompletely sustained in the relations of their hydracids with water; and even the comparative inspection of the atomic formulæ presents to us the compound of iodine occupying the intermediate rank, where we should rather expect to find the compound of bromine.

From this it appears that the causes which increase the tendency to assume the gaseous form, produce on the affinities of the hydracids for water effects which are not proportional to these affinities; since, with hydrobromic acid, to which known reactions assign an intermediate position, their influence is felt less than with hydrochloric and hydriodic acids.

The solution of bromine and iodine in their aqueous hydracids is subject to definite proportions, at least within certain limits; but these proportions differ in the two substances. Thus, in presence of a great quantity of water, hydrobromic acid dissolves three times as much bromine as it contains itself, whilst hydriodic acid dissolves only as much iodine as it contains. Moreover, while by boiling or mere exposure to the air, hydrobromic acid charged with bromine always readily abandons the excess of bromine, ioduretted hydriodic acid, at least if it be very much diluted with water, allows the iodine to be concentrated in it by ebullition, until there are four equivalents of this simple body to one of the hydracid.

The property which the hydracids of chlorine and bromine possess of concentrating more by cold evaporation than by ebullition at a high temperature, easily finds its explanation in their tendency to volatilise as the temperature rises. Nevertheless, it appears to me to be a very remarkable peculiarity. Similar examples were not known until now; the destruction which boiled hydrochloric and hydrobromic acids undergo by the simple fact of their evaporation, indicates their instability, and renders it almost indubitable, that during their distillation, there is a *momentary* separation between the acid and the water, then immediate recomposition at the time of condensation. Hence the vapor produced during their ebullition should be regarded as only a simple mixture of steam and acid gas. The densities of vapor found for the compounds in question completely agree with this view, which, according to all appearance, should also extend to hydrated hydriodic acid, and from which must be admitted the volumes of vapors represented by

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* *Comptes Rendus.*

$$Ch_{\frac{1}{18}}\ H_{\frac{1}{18}},\ H_{\frac{8}{9}}\ O_{\frac{4}{9}};\ Br_{\frac{1}{12}}\ H_{\frac{1}{12}},\ H_{\frac{5}{6}}\ O_{\frac{5}{12}};\ I_{\frac{1}{13}}\ H_{\frac{1}{13}},\ H_{\frac{11}{13}}\ O_{\frac{11}{26}};$$

formula too complicated to be probable.

USE OF CARBON IN GROVE'S BATTERY.*

BY BENJAMIN SILLIMAN, JUN.

Some months since, being engaged in experiments with Grove's flat-celled battery, some of the prominent defects of form, construction and expense seemed to me to be remediable, by another mode of construction, and the use of a cheaper negative element. About the same time, I learned that Berzelius had, in a letter to Dr. Hare, given an account of a battery where coke was at once the negative element and the containing vessel for the nitric acid.

I have since made many arrangements, and now give the result which seems most promising. Natural plumbago, or the mixture of it with sand, such as is used in the manufacture of crucibles, gives the form of carbon, which is at once the most effective, cheap, and manageable. A battery was constructed of six cylindrical members of native plumbago, each element one inch in diameter, and two inches high, placed in nitric acid, of the commercial strength, contained in a cylindrical cup of porous queen's ware, and opposed by a circular zinc element amalgamated. The connection was formed by a wire dipping from each zinc into a mercury cup excavated in the top of the plumbago cylinders. This battery of six members gave results which were highly satisfactory. In decomposing power, it accomplishes more than 100 pairs of zinc and copper of six inches square each. It gave five cubic inches of the mixed gases of water in less than 50 seconds, or one cubic inch in 12 seconds. It also maintained for nearly an hour, at full incandescence, 14 inches of No. 30 platina wire coiled into a spiral. In all other modes of exhibition it shows a proportionate power.

I am now constructing a battery of large series on this plan, and when the results are obtained, will publish them more at length. I would remark to those who are interested in constructing similar batteries, that plumbago is easily obtained from Stourbridge, Mass., of a compactness very suitable for batteries; and moreover, that (as before remarked) the mixed plumbago of the manufacturers of "black lead" ware answers very well. The porous cells used in my experiments have been made at Jersey City, N. J.

Yale College Laboratory,
Sept. 12, 1842.

ON THE SOLUBILITY OF ARSENIOUS ACID IN NITRIC ACID.*

BY DR. BUCHNER.

Many chemists have thought that the white oxide of arsenic dissolves as easily in dilute nitric acid as in hydrochloric acid, without being converted into arsenic acid; but H. Rose says, in his *Analytical Chemistry*, 4th ed.,—"Nitric acid dissolves only very small quantities of arsenious acid, without converting it, even by heat, into arsenic acid. This transformation is effected only by *aqua regia.*" This assertion is true, if the nitric acid be not heated to ebullition; but it must be rectified, as regards a higher temperature.

Dr. Buchner triturated 30 centigrammes of vitreous arsenious acid, gradually adding to it about 3 grammes of dilute nitric acid, sp. gr. 1·230. There was neither complete solution, nor a disengagement of nitrous gas. The mixture was heated to ebullition in a matrass; nitrous gas was then developed, red vapors being produced, and the solution was easily and completely effected. It may, therefore, be admitted, that one part of arsenious acid is perfectly dissolved in ten parts of nitric acid of the sp. gr. 1·230. But it is not correct to suppose that the arsenic is not oxidised in this case; the developement of nitrous gas proves the contrary. However, the author found that, by cooling, a portion of arsenious acid was precipitated in the pulverulent state from the solution, and that the latter still contains much of this acid in more of the arsenic acid formed.

Besides, it rests well demonstrated that arsenious acid dissolves much more easily, and in much greater quantity, in hydrochloric than in any oxyacid, probably because chloride of arsenic is formed, and besides, that potassa and soda are very nearly the best solvents of this acid, in cases wherein it must be promptly and entirely dissolved, and in great quantity. It is for this reason that V. Rose has recommended the employment of potassa in medico-legal inquiries, to completely dissolve arsenious acid, and separate it from animal substances.

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* From Silliman's *American Journal of Science and Art*, Oct. 1842.

* Buchner's *Repertorium für die Pharmacie.*

ACETATE OF SODA WITH NINE ATOMS OF WATER.*

BY MR. ANTHON.

Mr. Anthon obtained acetate of soda in fine crystalline needles, from a dilute solution prepared by the double decomposition of acetate of lead and sulphate of soda. He found that these crystals contained 49·60 per cent. of water of crystallisation, which is much more considerable than is generally admitted, although the salt examined had been perfectly dried in the air in summer. This answers to eight atoms; this acetate had, therefore, the following composition:—

1 at. soda . .	31·3	19·16
1 at. acetic acid .	51·0	31·24
9 at. water . .	81·0	49·60
	163·3	100·00

EUCLASE IN CONNECTICUT.

This rare mineral is found in its gangue (for the first time ever observed) at the topaz and fluor vein of Mr. Lane, at Trumbull. It occurs in thin, transparent, yellowish white, tabular crystals, lining cavities in a silvery white mica, and sometimes imbedded in a dark purple fluor.—Dr. C. U. Shepherd, in *American Journal of Science and Art*, Oct. 1842.

SUPPOSED PHENAKITE FROM GOSHEN, MASS.

A new examination of the specific gravity of this mineral* satisfies me that it is not phenakite. Its gravity = 2·75 to 2·76, which is too low for phenakite, and slightly superior to beryl. It also slightly exceeds in harshness, this last mineral.—*Ibid.*

CALSTRON—BARYTE.

I have lately examined new specimens of this mineral, with results so various in regard to the carbonates present, as to lead me to consider it a mechanical mixture of heavy spar, strontianite and calcite, and therefore not entitled to be considered as a mineralogical species.—*Ibid.*

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

IMPROVEMENTS IN THE METROPOLIS.†

BY CHARLES WATT, JUN.

Whitehall, Nov. 30, 1842.

The Queen has been pleased to appoint the Earl of Lincoln, Lord Lyttleton, Lord Colborne, the Right Hon. James Charles Herries, the Right Hon. the Lord Mayor of the City of London, Sir Robert Harry Inglis, Bart., Sir Charles Lemon, Bart., Henry Thomas Hope, Esq., Henry Gally Knight, Esq., Alexander Milne, Esq., the Hon. Charles Gore, Sir Robert Smirke, Knt., and Charles Barry, Esq., to be Her Majesty's Commissioners for inquiring into and considering the most effectual means of improving the Metropolis, and of providing increased facilities of communication within the same.

Pleased indeed must be the inhabitants of London to see the announcement, which it is to be hoped will terminate in the adoption of some required improvements, as regards, among other things, the cleanliness of this large city.

There is one thing to which I would beg particularly to call the attention of this Commission, *i. e.* to the disgracefully black condition, from smoke, of our public buildings.

I would beg to remind them that this nuisance might be, to a very great extent, at any rate, removed. There are several methods in existence for consuming smoke, and which are also beneficial in the saving of fuel which they effect. It is true that these only apply to manufactories, but they might likewise be used in those small steam-boats which ply up and down the river, and which, when they are passing under the arches of the various bridges, cover the passers by, to their great annoyance, with "blacks." Could not some method be adopted for consuming the smoke from the chimneys of various private dwellings? This might, I think, be done.

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* See *Silliman's Journal*, Vol. XXXIV. p. 329.

† From the *London Gazette*.

* Buchner's *Repertorium für die Pharmacie*.

The public generally may not be aware that if the fuel is supplied at the bottom of the stove, and some bright fire always kept at the top, a very little smoke will be produced, and a considerable saving of fuel effected. This may be in some measure accomplished by taking some of the red hot cinders from the bottom of the fire, and placing them on the coals when they have been recently put on.

Smoke is a mixture of carbonaceous and other matters, and it must be palpable, that if what generally passes up the chimney be consumed, much saving of fuel must be effected.

This is the principle of one of the plans now used (perhaps, more properly speaking, suggested) for consumption of smoke: the coals are very slowly supplied at one end of the boiler fire, and the carbonaceous matters are consumed when they reach those in the incandescent state.

In calling the attention of the Commission to this subject, I would ask them to compare the exteriors of our buildings with those of France—"to look on this picture and on that,"—and they will be soon convinced that they cannot turn their attention to a subject that more requires it, in any attempts they make make to improve this metropolis—an undertaking pregnant with importance to the public as regards health and comfort.

Smoke produces many other ill effects besides the disfigurement of public edifices; the delicate articles of manufacture which are exhibited in the shops near the manufacturing districts of the metropolis are seriously injured by it, as the shopkeepers, to their sorrow, can testify.

It is well known that the Marquis of Westminster offered a large sum of money to the gas works that supply Pimlico with smoke, to remove their premises, but they would not do so, not being able to procure another convenient site. Now, I have no doubt but that the Marquis would be glad to enter into some arrangement with the Company, to adopt some one of the methods of getting rid of the nuisance, and which must considerably depreciate the value of his lordship's property in that neighborhood.

It may be thought by some, that if the plans which have been suggested answered the required purpose, recommending themselves to manufacturers by their economy, they would soon be adopted; but I am sorry to say that many of these gentlemen have not yet arrived at such a state of enlightenment as to know, in many instances, what is beneficial.

I would recommend the Commission to inquire into this subject; and if they come to the conclusion that any of the proposed plans may be advantageously adopted, they will know what steps to take to secure their being so, and thereby strike a blow at one of the worst of nuisances.

I would, with all due deference, suggest an extension of this Commission; I cannot see why the inhabitants of Liverpool, Manchester, Birmingham, &c., should not share a portion of such benefit,—no one will deny that they are much in want of it.

ON THERMOGRAPHY.*

BY ROBERT HUNT, ESQ., SECRETARY TO THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

THE *Journal of the Academy of Sciences of Paris*, for the 18th of July, 1842, contains a communication made by M. Regnault from M. Moser of Konigsberg, "Sur la Formation des Images Daguerriennes;"† in which he announces the fact, that "*when two bodies are sufficiently near, they impress their images upon each other.*" The Journal of the 29th of August contains a second communication from M. Moser, in which the results of his researches are summed up in twenty-six paragraphs. From these I select the following, which alone are to be considered on the present occasion.

"9. All bodies radiate light even in complete darkness.

"10. This light does not appear to be allied to phosphorescence, for there is no difference perceived whether the bodies have been long in the dark, or whether they have been just exposed to daylight, or even to direct solar light.

"10. Two bodies constantly impress their images on each other, even in complete darkness.

"14. However, for the image to be appreciable it is necessary, because of the divergence of the rays, that the distance of the bodies should not be very considerable.

"15. To render the image visible, the vapor of water, mercury, iodine, &c., may be used.

"17. There exists *latent light* as well as latent heat."

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* Read before the Royal Cornwall Polytechnic Society, Tuesday, Nov. 8, 1842.

† *Comptes Rendus*, tome xv., No. 3, folio 119.

The announcement at the last meeting of the British Association of these discoveries, naturally excited a more than ordinary degree of interest. A discovery of this kind, changing, as it does, the features, not only of the theories of light adopted by philosophers, but also the commonly received opinions of mankind, was more calculated to awaken attention than any thing which has been brought before the public since the publication of Daguerre's beautiful Photographic process. Having instituted a series of experiments, the results of which appear to prove that these phenomena are not produced by *latent light*, I am desirous of recording them.

I would not be understood as denying the absorption of light by bodies; of this I think we have abundant proof, and it is a matter well deserving attention. If we pluck a Nasturtium when the sun is shining brightly on the flower, and carry it into a dark room, we shall still be enabled to see it by the light which it emits.

The human hand will sometimes exhibit the same phenomenon, and many other instances might be adduced in proof of the absorption of light; and I believe, indeed, of the principle that light is latent in bodies. I have only to show that the conclusions of M. Moser have been formed somewhat hastily, being led, no doubt, by the striking similarity which exists between the effects produced on the Daguerreotype plates under the influence of light, and by the juxtaposition of bodies in the dark, to consider them as the work of the same element.

1. Dr. Draper, in the *Philosophical Magazine* for September, 1840, mentions a fact which has been long known,—"That if a piece of very *cold* clear glass, or what is better, a *cold* polished metallic reflector, has a little object, such as a piece of metal, laid on it, and the surface be breathed over once, the object being then carefully removed, as often as you breathe again on the surface, a spectral image of it may be seen, and this singular phenomenon may be exhibited for many days after the first trial is made." Several other similar experiments are mentioned, all of them going to show that some mysterious molecular change has taken place on the metallic surface, which occasions it to condense vapors unequally.

2. On repeating this simple experiment, I find that it is necessary for the production of a good effect, to use dissimilar metals; for instance, a piece of gold or platina on a plate of copper or of silver will make a very decided image, whereas copper or silver on their respective plates gives but a very faint one, and bodies which are bad conductors of heat placed on good conductors, make decidedly the strongest impressions when thus treated.

3. I placed upon a well polished copper plate, a sovereign, a shilling, a large silver medal, and a penny. The plate was gently warmed by passing a spirit lamp along its under surface; when cold, the plate was exposed to the vapor of mercury; each piece had made its impression, but those made by the gold and the large medal were most distinct; not only was the disc marked, but the lettering on each was copied.

4. A bronze medal was supported upon slips of wood, placed on the copper, one eighth of an inch above the plate. After mercurialisation, the space the medal covered was well marked, and for a considerable distance around, the mercury was unequally deposited, giving a shaded border to the image; the spaces touched by the [mercury ?] were thickly covered with the vapor.

5. The above coins and medals were all placed on the plate, and it was made too hot to be handled, and allowed to cool without their being removed; impressions were made on the plate in the following order of intensity,—gold, silver, bronze, copper. The mass of the metal was found to influence materially the result; a large piece of copper making a better image than a small piece of silver. When this plate was exposed to vapor, the results were as before. On rubbing off the vapor, it was found that the gold and silver had made permanent impressions on the copper.

6. The above being repeated with a still greater heat, the image of the copper coin was, as well as the others, most faithfully given, but the gold and silver only made permanent impressions.

7. A *silvered* copper plate was now tried with a moderate warmth. Mercurial vapor brought out good images of the gold and copper; the silver marked, but not well defined.

8. Having repeated the above experiments many times with the same results, I was desirous of ascertaining if electricity had any similar effect; powerful discharges were passed through and over the plate and discs, and it was subjected to a long continued current without any effect. The silver had been cleaned off from the plate, it was now warmed with the coins and medals upon it, and submitted to discharges from a very large Leyden jar; on exposing it to mercurial vapor, the impressions were very prettily brought out, and strange to say, spectral images of those which had been received on the plate when it was silvered. Thus proving that the influence, whatever it may be, was exerted to some depth in the metal.

9. I placed upon a plate of copper, blue, red, and orange colored glasses, pieces of crown and flint glass, mica, and a square of tracing paper. These were allowed to remain in contact half an hour. The space occupied by the red glass was well marked, that covered by the orange was less distinct, but the blue glass left no impression; the shapes of the flint and crown glass were well made out, and a remarkably strong impression where the crown glass rested on the tracing paper, but the mica had not made any impression.

10. The last experiment repeated. After the exposure to mercurial vapor, heat was again applied to dissipate it; the impression still remained.

11. The experiment repeated, but the vapor of iodine used instead of that of mercury. The impressions of the glasses appeared in the same order as before, but also a very beautiful image of the mica was developed, and the paper well marked out, showing some relation to exist between the substances used, and the vapors applied.

12. Placed the glasses used above, with a piece of well smoked glass, for half an hour, one twelfth of an inch below a polished plate of copper. The vapor of mercury brought out the image of the smoked glass only.

13. All these glasses were placed on the copper, and slightly warmed; red and smoked glasses gave, after vaporisation, equally distinct images, the orange the next, the others left but faint marks of their forms; polishing with Tripoli and putty powder would not remove the images of the smoked and red glasses.

14. An etching, made upon a smoked etching ground on glass, the copper and glass being placed in contact. The image of the glass only could be brought out.

15. A design cut out in paper was pressed close to a copper plate by a piece of glass, and then exposed to a gentle heat; the impression was brought out by the vapor of mercury in beautiful distinctness. On endeavouring to rub off the vapor, it was found, that all those parts which the paper covered, amalgamated with mercury, which was removed from the rest of the plates; hence there resulted a perfectly permanent white picture on a polished copper plate.

16. The colored glasses before named, were placed on a plate of copper with a thick piece of charcoal, a copper coin, the mica and the paper, and exposed to fervent sunshine. Mercurial vapor brought up the images in the following order: smoked glass, crown glass, red glass, mica beautifully delineated, orange glass, paper, charcoal, the coin, blue glass; thus distinctly proving that the only rays which had any influence on the metal, were the calorific rays. This experiment was repeated on different metals, and with various materials, the plate being exposed to steam, mercury, and iodine; I invariably found that those bodies which absorbed or permitted the permeation of the most heat gave the best images. The blue and violet rays could not be detected to leave any evidence of action, and as spectra imprinted on photographic papers by light, which had permeated these glasses, gave evidence of the large quantity of the invisible rays which passed them freely, we may also consider those as entirely without the power off effecting any change on compact simple bodies.

17. In a paper which I published in the *Philosophical Magazine*, for October, 1840, I mentioned some instances in which I had copied printed pages and engravings on iodised paper, by mere contact and exposure to the influence of the calorific rays, or to artificial heat. I then, speculating on the probability of our being enabled, by some such process as the one I then named, to copy pictures and the like, proposed the name of THERMOGRAPHY, to distinguish it from Photography.

18. I now tried the effects of a print in close contact with a well polished copper plate. When exposed to mercury, I found that the outline was very faithfully copied on the metal.

19. A paper ornament was pressed between two plates of glass, and warmed; the impression was brought out with tolerable distinctness on the under and warmest glass, but scarcely traceable on the other.

20. Rose leaves were faithfully copied on a piece of tin plate, exposed to the full influence of sunshine, but a much better impression was obtained by a prolonged exposure in the dark.

21. With a view of ascertaining the distance at which bodies might be copied, I placed upon a plate of polished copper, a thick piece of plate glass, over this a square of metal, and several other things, each being larger than the body beneath. These were all covered by a deal box, which was more than half an inch distant from the plate. Things were left in this position for a night. On exposing to the vapor of mercury it was found that each article was copied, the bottom of the deal box more faithfully than any of the others, the grain of the wood being imaged on the plate.

22. Having found, by a series of experiments, that a blackened paper made a stronger image than a white one, I very anxiously tried to effect the copying of a printed page or a print. I was partially successful on several metals; but it was not

until I used copper plates amalgamated on one surface, and the mercury brought to a very high polish, that I produced anything of good promise. By carefully preparing the amalgamated surface of the copper, I was at length enabled to copy from paper, line-engravings, wood-cuts, and lithographs, with surprising accuracy. The first specimens produced, (which I have the satisfaction of now submitting to your inspection,) exhibit a minuteness of detail and sharpness of outline, quite equal to the early Daguerreotypes and the Photographic copies, prepared with chloride of silver.*

The following is the process at present adopted by me, which I consider far from perfect, but which affords us very delicate images.

A well polished plate of copper is rubbed over with the nitrate of mercury, and then well washed to remove any nitrate of copper which may be formed; when quite dry, a little mercury taken up on soft leather or linen is well rubbed over it, and the surface worked to a perfect mirror.

The sheet to be copied is placed smoothly over the mercurial surface, and a sheet or two of soft, clean paper being placed upon it, is pressed into equal contact with the metal by a piece of glass, or flat board; in this state it is allowed to remain for an hour or two. The time may be considerably shortened by applying a very gentle heat for a few minutes to the under surface of the plate. The heat must on no account be so great as to volatilise the mercury. The next process is to place the plate of metal in a closed box, prepared for generating the vapor of mercury. The vapor is to be slowly evolved, and in a few seconds the picture will begin to appear; the vapor of mercury attacks those parts which correspond to the white parts of the printed page or engraving, and gives a very faithful, but a somewhat indistinct image. The plate is now removed from the mercurial box, and placed into one containing iodine, to the vapor of which it is exposed for a short time; it will soon be very evident that the iodine vapor attacks those parts which are free from mercurial vapor, blackening them. Hence there results a perfectly black picture, contrasted with the grey ground formed by the mercurial vapor. The picture being formed by the vapors of mercury and iodine, is of course in the same state as a Daguerreotype picture, and is readily destroyed by rubbing. From the depth to which I find the impression made into the metal, I confidently hope to be enabled to give to these singular and beautiful productions a considerable degree of permanence, so that they may be used by engravers for working on.

It is a curious fact that the vapors of mercury and of iodine attack the plate differently; and I believe it will be found that vapors have some distinct relation to the chemical or thermo-electrical state of the bodies upon which they are received. Moser has observed this, and attributes the phenomena to the colors of the rays, which he supposes to become latent in the vapor on its passing from the solid into the more subtile form. I do not, however, think this explanation will agree with the results of experiments. I feel convinced that we have to deal with some thermic influence, and that it will eventually be found that some purely calorific excitement produces a molecular change, or that a thermo-electric action is induced, which effects some change in the polarities of the ultimate atoms of the solid.

These are matters which can only be decided by a series of well conducted experiments; and, although the subject will not be laid aside by me, I hope the few curious and certainly important facts which I have brought before you, will elicit the attention of those whose leisure, and well known experimental talents, qualify them in the highest degree for the interesting research into the action of those secret agents, which exert so powerful an influence over the laws of the material creation. Although attention was called to the singular manner in which vapors disposed themselves on plates of glass and copper, two years since, by Dr. Draper, Professor of Chemistry at New York, and about the same time to the calorific powers of the solar spectrum, by Sir John Herschel,* and to the influence of heat artificially applied, by myself; yet it is certainly due to M. Moser, of Königsberg, to acknowledge him to be the first who has forcibly called the attention of the scientific world to an inquiry which promises to be as important in its results, as the discovery of the electric pile by Volta.

As to the practical utility of this discovery, when we reflect on the astonishing progress made in the art of Photography since Mr. Fox Talbot published his first process, what may we not expect from Thermography, the first rude specimens of which exhibit far greater perfection than the early efforts of the sister art?

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* The first faithful copy of the lines of a copper-plate engraving was obtained by Mr. Cantabrana, who has since succeeded in procuring some tolerable specimens on unamalgamated copper, which cannot be rubbed off.

* *Philosophical Transactions*, Part 1st for 1840, page 50.

As a subject of pure scientific interest, Thermography promises to develop some of those secret influences which operate in the mysterious arrangements of the atomic constituents of matter, to show us the road into the yet hidden recesses of Nature's works, and enable us to pierce the mists which at present envelope some of the most striking phenomena, which the penetration and industry of a few "chosen minds" have brought before our obscured visions. It has placed us at the entrance of a great river, flowing into a mighty sea, which mirrors in its glowing waters some of the most brilliant stars which beam through the atmosphere of truth.

Falmouth, Nov. 7, 1842.

MANUFACTURE OF IODINE AND MURIATE OF POTASSA.

To the Editors of The Chemist.

Gentlemen,—

I send you a process for the manufacture of iodine and muriate of potash. I can send you more similar ones, if you think this worth inserting in your valuable Journal.

I am, Gentlemen,
Your most obedient Servant,
An Iodine Maker.

Iodine and muriate of potassa are made from kelp, of which there are two kinds, namely—Irish and Highland kelp: the former is that which is used by the manufacturers of iodine; the latter is generally bought up by soap-makers; it contains little iodine.

The kelp is broken down by hammers to about the size of one cubic inch, and put into large cast metal cisterns or "caves" (as they are termed by the workmen), with warm water; after standing about 12 hours, the lixivium is let off through a filter made of straw, which has been previously set before the stop-cock in the inside of the cave: the first lixivium will stand 1·250 specific gravity, and the same process is continued until it falls to 1·130 sp. gr.; after which it is run on another stronger cave till it falls to 1·040, or 1·050 sp. gr.

The insoluble matter left in the cave is used by bottle glass makers.

The liquor between 1·250 and 1·130 sp. gr. is boiled till it reaches 1·300 or 1·310 sp. gr., at the boiling point: it is allowed to settle for an hour or two, and then run off into coolers to crystallise. The black salt left in the pan in this, the first boiling, as it contains a notable quantity of muriate of potassa, is put back upon a cave. As soon as the scum which forms on the top of the liquid in the cooler falls,—which takes place about the fifth day,—it should be drawn off, and the crystals of muriate of potash lifted out of the cooler and drained for a day or two in baskets placed on the top of the coolers, so that the drainings may not be lost.

The liquid is again boiled to 1·340 sp. gr., crystallised, and boiled a third time to 1·370 sp. gr., and crystallised. These two last mentioned specific gravities are at the boiling point of the liquid. The salt taken out of the pan in the last two boilings is principally composed of sulphate, carbonate, and muriate of soda, and is used by soap-makers; the crystals of muriate of potash which form in the cooler are drained in the manner mentioned at the first boiling.

The finished liquid is now placed in a wooden vessel and saturated slowly with dilute sulphuric acid, say at the sp. gr. of 1·700, or 1·600; allowed to stand for two days, so that the sulphur which is set free from the decomposition of the sulphurous and hydrosulphuric acids, which the liquid contains combined with soda, may gather on the top of the liquid; and then put into a cast metal pot tightly covered with a leaden top, from which short leaden pipes lead the vapors of iodine into bottles of stoneware placed after the manner of a Woulfe's apparatus. There must also be a hole in the cover fitted accurately with a stopper made of lead, through which the manganese may be poured.

The liquid is brought to the boiling point, or nearly so, and the black peroxide of manganese is then added in small quantities at a time; when the red vapors cease to rise the liquid should be well stirred and a little more sulphuric acid added, and by taking care not to add too much sulphuric acid or peroxide of manganese at a time, the whole of the iodine may be easily driven over into the stoneware bottles, where it will condense in small crystals. After three or four operations the bottles may be placed on their mouths for a day, to allow most of the liquid to drain off.

The iodine is then swept into glass bottles, which are also allowed to stand on their mouths for a few days, and are then firmly corked and sealed.

OIL OF INDIAN CORN.*

BY CHARLES TRACY, ESQ., OF UTICA.

This oil is obtained in the course of the process of making whisky. It rises in the mash-tubs, and is found in the scum at the surface, being separated either by the fermentation or the action of heat. It is then skimmed off, and put away in a cask, to deposit its impurities; after which it is drawn off in a pure state, fit for immediate use. This oil is limpid, has a slight tinge of the yellow color of the corn, and is inoffensive to the taste and smell. It is not a drying oil, and therefore cannot be used for paint; but burns freely in lamps, and is useful for oiling machinery.

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* From Silliman's *Journal of Science and Art*, Oct. 1842.

Both rye and Indian corn are used for distilling, sometimes separate, but often mixed together. When rye is worked, either alone or mixed with corn, no oil is produced; and as the use of corn alone has been commonly supposed to be less profitable for whisky-making, the existence of corn oil in the froth of mash-tubs seems not to have been generally known among distillers until within a few years past. It is now ascertained that by working Indian corn alone, and using a somewhat higher heat than is common, oil may be produced at the rate of one pint for every bushel of corn; and that, too, without diminishing the quantity of alcohol, or impeding its manufacture. The oil sells for one dollar a gallon. The pint of oil, therefore, repays one fourth of the first cost of the bushel of grain which produces it.

ON THE FORMATION OF WHITE LEAD.*

BY MR. HOCHSTETTER.

Much light has been thrown on the formation of white lead by the recent observations of Liebig and Pelouze. They are of opinion that, in the Dutch method, the lead is oxidised at the expense of the oxygen of the air, and that the vinegar acts only as a medium in the production of the subcarbonate of lead. This opinion is confirmed by the following experiments made by Mr. Hochstetter:—

A glass cylinder, open at both ends, and furnished with a grating formed of small leaden bars, was filled with lead obtained in a state of very fine division by pouring it, drop by drop, into water. This was suspended in a cylindrical glass vessel, at the bottom of which was some pure and dilute vinegar, and left to itself for ten days in an atmosphere free from carbonic acid, which was obtained in a wooden case containing pieces of caustic lime. At the end of this time, the portions most directly exposed to the vapors of the vinegar were covered with white efflorescences, which dissolved, almost without turbidness, in pure water. This apparatus was left to itself, for the same time, in the ordinary atmosphere, and the efflorescences then found consisted chiefly of white lead; the soluble portion was neutral acetate of lead.

Lead, likewise very finely divided, was moistened in a flask, with very weak vinegar, and kept in a sand-bath at about 35° C. The access of air was completely prevented, and a current of carbonic acid was driven into the flask containing the lead, which was fitted with a tube dipping into water. The action was continued for 12 hours. The lead, at the termination of the operation, retained its metallic lustre. At the end of this time, atmospheric air was admitted, and, in about an hour, the pieces of lead became dull; but in 6 hours they were quite white, that is to say, they were covered with white lead.

White lead, thus obtained, ordinarily contains quantities of acetate of lead, varying from 2 to 12 per cent. This salt arises from the conversion of the basic acetate into white lead and acetate of lead; but, according to the foregoing theory, its proportion should be more considerable than that commonly contained in crude white lead. Experiments on this subject have shown Mr. Hochstetter, that crystallised acetate of lead, which has been for some time exposed to the air, is no longer completely soluble in water, and leaves a residue of white lead; that this decomposition takes place at the ordinary temperature, and in presenee of a small quantity of carbonic acid; and that it should be operated still better at a higher temperature, and in an atmosphere containing much carbonic acid. An atmosphere completely saturated with steam is a necessary condition of this transformation, for, without it, there is no absorption of carbonic acid, although the acetate of lead has lost some of its acetic acid. Observation on the large scale perfectly corroborates this opinion; for the quantity of acetate of lead which crude white lead, formed in the dung-bath, contains, is much less than that of white lead, made by treating, in heated spaces, lead inclosed in boxes containing vinegar.

To conclude, the formation of white lead, by employing the vapors of vinegar, depends—

1st. On the production of a basic acetate of lead:

2nd. On the decomposition of this salt, by carbonic acid, into white lead and neutral acetate of lead:

3rd. On the decomposition of the latter by carbonic acid mixed with steam; acetic acid is then disengaged, and white lead is formed.

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* *Journal für Praktische Chemie.*

IMPROVED METHOD OF OBTAINING LIKENESSES, REPRESENTATIONS OF NATURE, AND OTHER OBJECTS.*

BY RICHARD BEARD.

This invention consists in various modes of coloring the pictures produced by the Daguerreotype process.

By the first method, the object is obtained by reducing the colors to an impalpable powder, and depositing them upon different parts of the picture, in succession; the extent of each color being determined by a pattern or screen, resembling a stencil plate.

The *modus operandi* is as follows:—The Daguerreotype picture is first placed in a rectangular frame, which is formed with a projecting edge, of about one twentieth of an inch in thickness. Over this frame a piece of glass or mica is laid, and a tracing is made upon it, with coloring matter, of the shape of those parts of the picture that are to be colored. From this tracing a number of patterns or screens are formed, one for each color. Each screen consists of a light rectangular frame, covered with tracing paper, upon which all those parts that are requisite to be of one color are traced, and the space included between the traced lines is cut out; so that when the screen is placed upon the picture, the tracing paper will cover its surface, except those parts which are required to be of a uniform tint.

The colors are prepared by grinding them to an impalpable powder, with a weak solution of gum arabic, isinglass, starch, or other similar material; they are then dried in a stove (kept at a heat somewhat less than 212° Fahr.), and after being passed through a fine sieve, are ready for use.

In applying these colors, a number of boxes, of a size sufficient to admit the picture, are employed, and into each box, the number of which varies according to the tints requisite, a few grains (say about fifty) of color are deposited. The color is agitated with a large soft brush until a dust is created in the box, and the picture, covered by one of the screens, being then introduced, the particles of color settle upon the screen and upon those parts of the picture that are not covered by it. After this operation the picture is withdrawn, the screen taken off, and the color removed from the shaded parts by means of a small pair of bellows; the remainder of the color is then attached to the picture by breathing upon it, which partially dissolves the gum, and the process is completed.

The second improvement consists in mixing the colors with gum-water, and applying them, with a hair pencil, to the under side of the glass that covers the picture; so that when the latter is seen through the glass, it will present the appearance of a colored picture.

The third and last method consists in using the colors in a dry pulverised state, as in the first improvement, dotting them on to the picture, with small brushes, in a similar manner to stippling; the colors are then fixed by being breathed upon.—*Abstract of Specification.*

ON GALVANOGRAPHY.*

BY M. JACOBI.

The Academy will remember the first and successful galvanographic experiments which I had the honor of presenting to it in the name of his Imperial Highness the Duke of Leuchtenberg, at the sitting of August 7, 1840. The Duke executed various designs on copper plates polished or plated with silver, making use of a solution of Damara resin and oil of turpentine. A copy of these plates, made by the galvanoplastic process, immediately gave an engraving of the original drawing, capable of being reproduced by impression. This beautiful and important application of the galvanoplastic art has opened to the arts of design a new and extended field; indeed, a very peculiar artistical process has just been discovered, concerning which the Duke, in a letter which he recently sent to me, thus expresses himself:—

"The numerous experiments which I made, very soon demonstrated to me that we might obtain a peculiar product entirely distinct from engraving on copper and on wood, which very nearly resembles drawing in Indian ink, and may be regarded as equal to it. In all these experiments, that which I found most convenient, was executing, in the manner of Indian ink, drawings on the plate of metal. But I have also made designs simply with lines, and then the copy was not inferior to the best engravings on wood."

Instead of Damara resin, the Duke afterwards used common English lac, which he spread with a feather on the plates of polished metal, to which he had not given any preparation. Thus were made the writing characters and the designs, hastily traced, which I now present to you, and which show that the finest traces may be reproduced.

But besides the artistical and technical interest which the art of galvanography presents, the attention of the Duke of Leuchtenberg was no less attracted to the phenomenon which accompanies its application, and which consists in the non-conducting surfaces being also covered, little by little, with a layer of copper, and that with the most perfect regularity. Indeed, this phenomenon is not so easily explained as might have been at first believed, for it cannot be admitted that the non-conducting parts in relief owe their elevation to a slow growth which takes place from the under side. The following are the ideas to which the Duke has been led by the observations which he has made in the course of his experiments:—

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* *London Journal and Repertory of Arts, Science and Manufactures*, Dec. 1842.

* Read to the *Academy of Sciences of St. Petersburg*, Jan. 20, 1842.

"It was by no means necessary to cover the non-conducting design with a conducting or metallic layer, for the galvanic precipitation did perfectly well without that; indeed, in the space of 24, 48, or 72 hours, the polished plate was covered with a layer which increased in thickness, and the precipitate was gradually deposited on the parts in relief in proportion as the thickness of the general layer exceeded their level. Three periods, therefore, may be positively distinguished in the formation of my galvanographic plates:—

"First, the simultaneous formation of the layer on all the conducting points of the polished plate; which constituted a precipitation which filled all the conducting interstices. In the second period, increase of thickness of the non-conducting design,—an operation in which the lowest part in relief was first covered with a layer, whilst the most elevated was covered last. Finally, in the third period only, the increase of the layer deposited is made simultaneously and uniformly in all the points, for the galvanic current affected only places covered with metal, whence a simultaneous precipitation."

Indeed, galvanographic plates present in their mode of formation a striking difference with respect to ordinary galvanoplastic copies. In the latter, where the original is formed of metallic or conducting surfaces, we see on the reverse, even when of considerable thickness, exactly the elevations and the depressions which correspond to the original, and which are like the counter proof of the anterior face. But in the galvanographic plates which I have the honor of submitting to you, we see on the reverse and in the same order the traces of the opposite face, that is to say, the inverted copy of the original drawing. The elevations of Indian ink drawing produce corresponding depressions, not only on the anterior face of the galvanoplastic copies, but also on their reverse.

I also submit to the Academy another interesting experiment, made by His Imperial Highness, at Zarskoë-Selo, during last summer. Instead of using as a cathode, the polished metallic plate on which was the drawing or writing, the Duke put it in communication with the positive pole of the battery; in this position, all the plate was engraved under the galvanic action, with the exception of that part on which was the drawing or writing, which thus formed a design in relief from which copies might be taken as from a wood engraving. Here is, therefore, a new galvanographic process, which will likewise be susceptible, without doubt, of great perfection, and which might, in certain cases, be used as intermediate between the two others. It is scarcely necessary to add that the galvanic force exerts its regular action the same on a hastily executed drawing or writing as on the *chefs-d'œuvre* of art or of calligraphy.

When once an impulse was thus given to galvanography, there could not long be wanting distinguished artists of every kind who would make it the subject of their labors, and who would apply themselves to appropriating it, perfecting it to the best of their ability.

I am, therefore, happy in being able to present to the Academy, which has shown, from the commencement, a lively interest in the development of the galvanoplastic art, some galvanographic products which entirely respond to the expectations formed when the first attempts were seen to succeed. The plates which I now exhibit, and for which I am indebted to the kindness of the Count de Rantzau, ambassador from the King of Denmark to our Court, are copies of engravings, on copper, which were made according to the process of Mr. Hoffmann, a captain in the Danish Artillery, and which, for accuracy and clearness, are all that can be desired in a linear drawing with the pen, or in a lithograph. The composition of ink used by Mr. Hoffmann, a thing of great importance in the experiment, is not yet known; however, we may judge, from the copies, that this ink must possess, for the various linear drawings, properties which have always been wanting in the ingredients most resembling it which have hitherto been used. Mr. Hoffmann says on this subject, that last year, after many trials, he succeeded in discovering a substance which flows so well from the pen that it may be used for making drawings or writing characters as clear as with Indian ink. The following, according to the author, are the advantages which distinguish this process from ordinary engraving and lithography:—

It is not necessary to write inverted characters on the plate of metal; consequently any *dessinateur* may be employed for this work; and it is clear that he excels the engraver on copper, inasmuch as he possesses more talent in drawing or calligraphy, for the copies give perfect images of his work.

The transfer to copper is made in much less time, and consequently with much less expense.

Every fault in the drawing may be corrected with the greatest facility, without the plate being in the least damaged.

To judge from the objects to which Mr. Hoffmann has hitherto applied his galvanographic method, it appears that he has particularly devoted it to calligraphic, topographic and architectural works.

IMPROVEMENTS IN COATING OR COVERING METALS WITH OTHER METALS, AND IN COLORING METALLIC SURFACES.*

BY W. H. F. TALBOT, ESQ.

The following abstract of Mr. Talbot's Specification is taken from our excellent contemporary, *The London Journal and Repertory of Arts, Sciences, and Manufactures*, edited by Mr. W. Newton.

The first part of this invention relates to a method of coating or covering metals with gold, silver, or platinum. The improvement consists in the use of gallic acid, or of a liquid containing a fair proportion of it, or a similar vegetable substance, to facilitate the precipitation of those metals from their solution.

To the solution of gold, silver, or platinum, is added a solution of gallic acid, in water, ether, or alcohol; then into this mixture a clean bright plate of metal is immersed, and allowed to remain until it is coated with the gold, silver, or platinum contained in the solution.

The second improvement consists in silvering metallic surfaces, in the following manner:—The plate, or other article of metal, is first made clean and bright, and is then covered with a bright silver coating, by immersing it in a solution formed by dissolving a quantity of freshly precipitated chloride of silver in hyposulphite of soda or any other liquid hyposulphite.

Thicker coatings of metal may be obtained by the aid of a galvanic battery, using in combination with either of the solutions above mentioned, and employing, for one of the piles, a piece of metal of the same kind as that which is to be precipitated.

The metals which can be coated by means of these improvements, are brass, copper, silver, German silver, and also (though less effectually) iron and steel.

The third improvement consists in a method of ornamenting the surfaces of brass and copper; which is effected by gilding them partially, according to a pattern, and then washing them over with a solution of chloride of platinum.

The solution does not act upon those parts that are gilded, but enhances their brilliancy, by giving to the rest of the surface a dead black appearance.

The fourth improvement consists in a mode of coloring polished surfaces of copper. This is effected by exposing the metal to the vapor of sulphuretted hydrogen, or of any of the liquid hydrosulphurets; or to the vapors of sulphur, iodine, bromine, or chlorine; or by dipping it into liquids containing them.

As by this method the copper may be rendered nearly white, the patentee employs it for metallic specula or mirrors, which are made in the following manner:—An electrotype cast, in copper, is taken from a polished plane or spherical metallic surface; this cast has nearly the same degree of polish as the original, and is then exposed to the action of vapor, as above described, until it is sufficiently whitened, which is effected without injuring the polish.

The patentee claims:—

Firstly—The use of gallic acid or liquids containing it, or an analogous vegetable substance, for facilitating the precipitation of metals on other metallic surfaces, and coating them therewith.

Secondly,—The use of hyposulphite of soda or other liquid hyposulphites, for silvering metals; and the employment of a galvanic battery for obtaining thicker deposits of gold, silver, or platinum; but he claims this only when used in conjunction with one of the liquids before mentioned.

Thirdly,—The coloring of copper surfaces, by exposing them to the chemical action of the above-mentioned substances.

NEW PROCESS FOR OBTAINING, BY PRESSURE ON METALLIC COPPER, COPIES OF MEDALS AND OF OTHER SIMILAR OBJECTS.*

BY G. OSANN.

An observation which the author accidentally made in the year 1830, relative to copper reduced by hydrogen, during his investigations concerning the atomic weights, led him to the discovery of this new art. He had remarked that oxide of copper reduced by hydrogen gives an extremely fine powder, easily compressible, which, submitted to the action of heat, agglomerates and gradually unites, acquiring the solidity of melted copper. In repeating Jacobi's galvanoplastic process, he found that in using a simple battery, 6 or 7 days were necessary for obtaining copper impressions of the thickness of a line; his former observation recurred to his mind, and he tried to produce these impressions by compression. The experiment having succeeded, he published an account of it, in June last, in the *Wurtzbourg Gazette.*

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* Inrolled in the Inrolment Office, June, 1842.

* *Bibliothéque Universelle de Génève*, No. 82.

The following are some details concerning this process, extracted from the author's Memoir:—

I. A solution of sulphate of copper is made; it is boiled for half an hour to peroxidise the iron which it contains; it is filtered, boiled *de novo* and precipitated, while warm, by carbonate of soda gently poured into it. It is allowed to deposit, then washed by decantation, filtered through double paper, and slowly dried on blotting paper; it is afterwards strained through gauze, in order to obtain the finest powder.

II. This carbonate is placed in a long glass tube, and reduced by hydrogen purified with a little acetate of lead, then with potassa. The tube is heated by means of a lamp occasionally passed under it, as it is essential that the powder obtained should be very fine, and to insure this the reduction must be made at a very gentle heat. During the reduction there is very soon observed a pungent odor of sulphurous acid, which arises from a small portion of sulphate of copper obstinately remaining mixed with the carbonate. This gas, and the water which is disengaged, being at the furthest end of the tube, prevent the reduction there giving a very fine powder; the first portion is therefore withdrawn with a small iron hook, and it is separated to be treated again. The fine powder should present the aggregation of spongy platinum, and its color should be light copper red; this powder is very oxidisable in the air, it must therefore be immediately confined in a well closed vessel, and it is as well to use it the same day for taking impressions.

III. This powder must now be compressed on the medal. For this purpose a tube of white iron, of the diameter of the medal and about 4 inches in length is employed: it is enveloped in paper; powdered brick is first put in, then the medal is laid on, and on that a layer of very finely sifted copper, then the coarser powder, to the height of about 10 or 12 lines. Then gently press with a massive cylinder of iron; put the whole on an *anvil*, and strike it with a hammer until the powder becomes no further compressed. The whole is driven out of the tube by striking without supporting it; the copper has now become coherent and solid, and is easily separated from the medal. Instead of the hammer, a lever press may be used.

IV. The copies obtained must finally be heated to redness, to complete the agglomeration. To prevent the access of air, a copper box, furnished with a lid, is made; two copies are placed in it, and separated from one another by means of three small pieces of copper leaf. The box is luted with clay, and heated to the commencement of red-white; it is left to cool, and the impression is finished, solid, of a fine copper red, a little bronzed here and there where the compression has been strongest.

SOME INTERESTING FACTS RESULTING FROM THESE INVESTIGATIONS.

(*a*) Copper reduced by hydrogen gas is powerfully electrical. If we support on it, with a plate of brass furnished with a glass handle, the plate of a condenser, for example, this plate is so strongly electrised, that even at a considerable distance it acts on the gold leaf of an electrometer. This fact appears to be of considerable importance in theoretical chemistry. Osann regards it as one of the principal arguments in favor of the opinion which regards electricity and chemical affinity as one and the same force. In this state the copper is oxidisable in the highest degree, and at the same time highly electrical; may it not be supposed, from this double circumstance, that it is electricity which determines the combination of the copper with oxygen?

(*b*) If a small quantity of copper reduced by hydrogen be thrown into gaseous chlorine, it becomes inflamed in it at the ordinary temperature, and burns with a white flame. This experiment is curious, and easily repeated in chemical lectures; it is important, also, for demonstrating the influence of mass and cohesion on chemical affinity.

(*c*) Another curious phenomenon is the considerable contraction which the copper impressions undergo when heated to redness. The maximum of this contraction, estimated approximatively, may amount to one fiftieth of the diameter of the coin from which the impression has been taken. The design does not experience the slightest alteration, except that its dimensions are somewhat reduced.

(*d*) Copper thus agglomerated is harder than that which has been melted. This is perceptible to the touch, but still more so to the file. It is, doubtless, a very interesting fact, that copper, in the state of agglomeration, that is say, when its particles are farther apart than when it has been melted, is harder, and, apparently, more solid.

EXPERIMENTS FOR OBTAINING SIMILAR IMPRESSIONS WITH OTHER METALS.

As yet the author has experimented with only two metals, silver and lead. He prepared the silver by precipitating a solution of the nitrate by copper. After being washed and dried, it was placed on the coin, and thus submitted to the action of a lever press. The copy had the color of unpolished silver. It was then heated to redness in the copper capsule above described, which operation caused it to undergo some slight contraction, without any other alteration. The metal became solid and compact, and had a fine lustre.

The lead was precipitated by zinc from a solution of acetate of lead. The adhering water was removed with blotting paper, after which it was compressed on a piece of money. The impression easily separated from the metal; it presented an exact copy of it, but had a dull lead color which was not advantageous.

ADVANTAGES OF THIS PROCESS OVER THAT IN WHICH THE HYDRO-ELECTRIC CURRENT IS USED, AND ITS PRACTICAL APPLICATION.

The following are the principal advantages in question :—

(*a*) When once the copper powder is prepared there is not the least difficulty in making impressions of any thickness, and superior in hardness to copper that has been melted.

(*b*) Any body whatever, whether a conductor or a con-conductor of electricity, may be reproduced by these impressions of copper. Hence this process becomes capable of general employment, and may even be extended to organic bodies. The author tried to copy in copper, lithographic drawings on stone. In the same way might be taken copies of engravings on copper by *aqua fortis*, and even larger objects, such as statues. These impressions might afterwards serve as moulds for copies in relief on copper.

(*c*) The copies are of exceeding clearness, surpassing even that of the original. This is owing to the contraction which they undergo when heated to redness, and which causes the design to be reduced to smaller dimensions. As these impressions may in their turn serve as moulds for new copies in relief, it may be conceived that, by aid of their property of contracting by heat, we may obtain, from one medal, copies as small as can be desired.

(*d*) With this process may be obtained true copies of medals with two faces in relief. With this view, two hollow copies are taken, a layer of copper powder is put between them, and they are strongly pressed against one another. The copy obtained is hardened in the fire, which reproduces, with clearness, the medal on a rather smaller scale.

The following are some of the applications of this process, pointed out by the author :—

1. The hollow copies being very well reproduced in sealing wax, we may make of copper the required number of impressions of an engraving in relief on metal, and these impressions may serve as seals. Bodkins (*poinçons*) may thus be reproduced in a very simple manner and at little cost.

2. This process may be applied to type-founding. For this purpose, it would be sufficient to sift the reduced metallic powder into the matrix. The characters obtained would be rather smaller than the matrices, but more clear than those which are cast.

3. It may be employed for making metallic mirrors. For this, the reduced copper must be spread on a polished glass, concave or convex. The mass thus obtained is submitted to the action of fire, in the copper box, and is silvered on the internal or external surface, according as a convergent or divergent mirror is desired.

4. Copper reduced by hydrogen and compressed, contracting in so uniform a manner, by the action of heat, might serve with advantage for pyrometric measures. It would fulfil the same part as the clay cylinders in Wedgewood's pyrometer.

The medals of which copies have been made in copper, not being injured by this operation, it would be, to any one having at his disposal a cabinet of medals, a most favorable means of making very accurate copies of rare medals. Besides their great clearness, they would have the advantage over plaster of Paris of not being brittle. Thus might also be procured exact and durable copies of many other works of art.

AGRICULTURAL CHEMISTRY.

This highly important branch of Chemistry having lately attracted considerable attention among the more enlightened Agriculturists of this country, it is our intention, in the future Numbers of The Chemist, to give as many articles on the subject as can be obtained from any and every source.

In making this announcement, we may also state that we shall be glad to receive, for insertion, from those of our scientific and practical readers who have devoted their attention and talents to this subject, such original communications as may be considered valuable to the cultivators of the soil.

We shall not be backward in affording them our assistance in extending among them, to the utmost, knowledge so essential to successful competition with foreign growers, and will translate, from the continental works, all articles calculated to benefit the agricultural reader.

It is with feelings of no little pleasure that we have observed the stress laid on the application of Chemistry to Agriculture, by the Agricultural Societies, with whose recent meetings, in all parts of the country, the newspapers have lately been teeming, and we are confident that they will not appeal in vain to science: so far as The Chemist is concerned, they will always find a willing and energetic advocate, and a medium through which scientific knowledge may be widely diffused amongst them.

IMPROVEMENTS IN THE MANUFACTURE OF MANURE, OR A COMPOSITION TO BE USED ON LAND AS MANURE.*

BY J. CLISILD DANIELL.

These improvements consist in various modes of preparing certain substances, in order to render them fit for manuring land, or to make them more beneficial as a manure than they would otherwise be.

These substances are divided into three classes, viz.:—First class,—Ligneous matter, such as the stems, branches, or roots of trees, shrubs, woody plants, &c.; also peat, straw, weeds, &c. Second class,—Bituminous matter, such as mineral coal, asphaltum, pitch made from coal tar, vegetable pitch, and vegetable and mineral resin, &c.; likewise tar or other soft semi-liquid, or liquid bituminous matter. Third class,—Animal matter, such as the substance usually called greaves, butchers' offal, carrion flesh of any kind, &c.; and also those kinds of fish which can be easily procured at a sufficiently low rate to be economically used as manure.

The ligneous matters are ground into powder, by any suitable machinery; or they (as well as the bituminous and other such matters) may be reduced to powder, by exposing them to the action of caustic lime.

The bituminous and resinous matters, if sufficiently brittle, are in like manner ground into a fine powder, by machinery; but in case they are of an adhesive nature, such as asphaltum, pitch, &c., a small quantity of dry quicklime or other earthy matter is mixed with them, to keep them "free and loose," during the operation of grinding, and to prevent them adhering to the machinery. When the bituminous matters are in a soft, semi-liquid, or liquid state, they are converted, by dry distillation, into vapor, with which ligneous or other suitable matters, such as tanners' spent bark, dyers' spent wood, saw-dust, malt-dust, bean-chaff, ashes, or fine earths, are impregnated, in order to make them fit for use as manure.

The soft bituminous matter may be reduced to a state of minute division, by rendering it partly soluble in water, through the agency of caustic alkali; and in this mixture the ligneous substances above mentioned are steeped.

The animal matters are mixed with pulverised ligneous or bituminous substances, or with the other matters before mentioned, are then ground into a fine powder.

The mode of using any of the above manures, is depositing them in the ground with seed, by means of a drilling machine, or scattering them over the ground by what is called a broad-casting. — *Abstract of Specification.*

ACTION OF CARBONATE OF AMMONIA ON PLANTS.*

BY J. KLIER.

The *Gardenia Radicans* commonly begins to lose its leaves in November, and is entirely free from them at the commencement of January. The author wished to try the action of carbonate of ammonia on this plant. He surrounded it at the foot in the middle of November, with water containing 3 drops of this salt; eleven others, which were not subjected to the experiment, completely lost their leaves, while the one under experiment did not lose 4 in 100. As this plant watered with rain water grows better than when watered with spring water, and as it very quickly dies in earth containing incompletely decomposed animal excrements, the employment of carbonate of ammonia appears to offer some advantages.

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* *The London Journal and Repertory of Arts, Sciences, and Manufactures.*

* *Annalen der Chemie und Pharmacie.*

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

In making the alteration in this division of The Chemist, we feel it necessary to state the reason which has induced us to do so, which is chiefly, that the heading of "Pharmacy" alone does not sufficiently indicate the nature of the articles contained in the section, and we conceive that the title now adopted will be far more correct.

In this division, which is particularly addressed to Chemists and Druggists, and Medical Men, we shall, as heretofore. give all that is new in Pharmacy, Materia Medica, Therapeutics, Chemical Jurisprudence, &c.; we shall devote considerable attention to the exposure of the Adulterations of Medicinal Substances; and we shall continue our advocacy of the only just system of *Medical* Reform, as affects all branches of the Profession, uprooting abuses, by whatever influence shielded and upheld.

We shall at all times be glad to receive communications from practical men,—the free interchange of information among whom has, since the commencement of this Journal, so greatly raised the Chemists and Druggists of this country in a scientific point of view, and will, if continued, soon elevate them to the same position as their Continental brethren,—a position in which it has ever been our endeavour, and, as it appears, with no trifling degree of success, to place them.

ON LACTUCARIUM.[*]

BY M. AUBERGIER.

When incisions are made in the stalks of lettuces at the time of flowering, a very bitter juice, which rapidly dries in the air, flows out; this juice is called lactucarium: it has always been compared to the juice of the poppy. This comparison has appeared as well founded with regard to its medical action as its physical characters, to Dr. Coxe, who experimented on lactucarium at Philadelphia; to Duncan, and some of his compatriots, who examined it at Edinburgh; and finally, to Dr. Bidault de Villiers, who repeated, in France, the experiments made in America and in Great Britain. All these observers agree in the statement that lactucarium possesses the sedative properties of opium, without its inconveniences,—that is to say, it produces neither the obstinate constipation, nor the cerebral congestion, which often accompany the use of the latter medicine. As only such small quantities could be procured by incision, that Dr. Bidault de Villiers owns that he never possessed, at one time, more than 15 grammes, it was necessary to replace lactucarium by an extract prepared with the entire plant.[*]

I could, therefore, hope to solve the problem which I had proposed to myself only by cultivating species whose milky juice would have the same composition and properties as that of the cultivated lettuce, but whose stalks would take a greater developement than those of my first plantations. In thus taking for a guide the law of the analysis between vegetables belonging to the same groups, I arrived at a singular result: in certain species, the milky juice, instead of being bitter, is, on the contrary, insipid and sweetish. It contains much mannite, but no bitter principle, and has no sedative property. I may mention, for example, the *Lactuca stricta*, *acuminata*, and *elongata*, of North America. But in other species, as I expected, the milky juice had the same composition and the same medical properties as that of the cultivated lettuce: among the latter, the most remarkable and the most interesting, especially in the point of view under consideration, was indicated, if

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[*] *Comptes Rendus*, No. 20, Nov. 14, 1842.

[*] For a new and valuable method of collecting lactucarium, by M. Arnaud, see The Chemist, Vol. III. (First Series), page 359.

I may so speak, by its name; it is the *Lactuca altissima*, whose stems attain, by culture, to three metres in height, and four centimetres in diameter. Hence, by incisions, such quantities of milky juice may be obtained, that I do not hesitate to say that lactucarium will maintain over opium, as to price, the pre-eminence which is attributed to it with regard to medical properties.

At the moment when it flows out from the incisions, the juice presents the color and consistence of cream; it very soon coagulates and turns yellow, then brown, and dries very promptly, losing 71 per cent. of its weight; it often becomes covered with crystalline efflorescences, which Dr. Bidault de Villiers attributed to a vegetable alkali, and which are nothing but mannite; under the influence of the alkalis, the fresh juice acquires a rose color, and its solution causes a brown precipitate in the persalts of iron, whilst the supernatant liquor becomes green.

The analysis of lactucarium, which led me to establish the identity of the juice in certain species, gave the following results:—

A bitter crystallisable matter, mannite, and asparamide; a crystallisable matter turning green with the persalts of iron; an electro-negative resin combined with potassa, an indifferent resin, ulmate of potassa, cerin, myricin, pectin, albumen, acid oxalate of potassa, chloride of potassium, phosphate of lime and magnesia, oxides of iron and manganese, and, finally, silica.

From this analysis, it is evident that the lactescence of the juice of the lettuce is owing to a mixture of wax and resin, and not to caoutchouc, as Schroeder and Pfaff supposed. It is a vegetable emulsion, with wax for a base, resembling that furnished by the cow-thistle (*arbre de la vache*) whose nature was made known by M. Boussingault.

The rose coloration by the alkalis is due to the crystallisable matter which colors the persalts of iron green; it is generally found diffused, as well as mannite, in the milky juice of the cichoraceæ.

This matter presents remarkable properties which remind us of the part attributed to that hypothetical body which is called the extractive principle, and which is regarded as common to all vegetable juices. Indeed, it easily alters by the contact of the air, especially under the influence of the alkalis and heat; the last term of this alteration is ulmic acid, but it is preceded by different transformations to which I attribute the phenomena of coloration which I have noticed in the juice of the lettuce when exposed to the air. The presence, in many plants, of this kind of vegetable chameleon allows of doubts being raised as to the existence of the variety of tannin characterised by the property of forming a brown precipitate in the persalts of iron, with a green supernatant liquor. In the solutions of lactucarium, the precipitate is formed of an electro-negative resin, ulmic acid, and oxide of iron, and it is now known that it is a well-defined substance that gives to the supernatant liquor the green color regarded as characteristic.

The most interesting substance isolated in this analysis, is certainly the bitter matter which I obtained in the crystalline state, and which is to lactucarium what morphia is to opium, except that morphia is alkaline and the bitter matter of lactucarium neutral. This matter, which is almost insoluble in cold water, is more soluble in hot; it separates, by cooling, into pearly bracteæ, resembling boracic acid; it is soluble in dilute and strong alcohol, but more so in warm than in cold; it is completely insoluble in ether: when heated, it carbonises without subliming; its solution is decomposed under the influence of the alkalis, and the bitterness disappears, without being recoverable by an acid.

CITRATE, OR AMMONIO-CITRATE OF IRON.

BY MR. A. J. COOLEY.

Competition in the sale of this article has induced the manufacturer to adopt a cheaper formula than that originally published by Beral and employed by many houses. It is now frequently prepared by placing together, for some days, in a warm situation, a mixture of iron filings, and citric acid in powder, with barely sufficient water to cover them, occasionally stirring and replacing the water as it evaporates. A saturated solution is made in distilled water, there being previously added more *citric acid*,* if required; it is then neutralised with *liq. ammon. fort.*,† and concentrated by evaporation: the same plan mentioned at page 214, Vol. III. First Series, is followed to complete the process. The first part of this process produces a salt of the protoxide of iron, which is afterwards converted, by the exposure to the atmosphere, into a citrate of the magnetic oxide, and lastly into citrate of peroxide of iron.

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* *About* half the weight of the acid first used.

† *About* one ounce and a quarter to every gallon of the solution of a specific gravity of 1·025.

PREPARATIONS OF IRON.

BY DR. JOHN TODD.

Dr. John Todd, of Hackney, gives us the following easy and economical formulæ:—

LIQUOR FERRI POTASSIO-CITRATIS.

℞ Acid. citric. crystallizat., ℥j ʒv;
Potassæ carbonatis, ʒvij;
Ferri sesquioxydi, ℥j;
Sp. ammoniæ aromat., q. s.;
Aquæ distillat., ℥xxiv.

Dissolve the acid. citric. and potass. carb. in the water; when the effervescence has ceased, add the ferri sesquioxydi, and digest for twenty-four hours (frequently stirring) in a gentle heat; filter the liquid, and neutralise any excess of acid by dropping in, gradually, sp. ammon. arom., until it is saturated. The liquid is of a reddish brown color, not precipitated by alkalies, nor altered in color by the ferrocyanide of potassium, or tincture of galls. The taste is slightly styptic, though not unpleasant. It will be seen that there are two equivalents of acid. citric. combined with one equivalent of potassa, and one equivalent of the ferri sesquioxyd.—One drachm of this solution contains five grains of the dry ferri potassio-citras.

An agreeable syrup may be made by dissolving sacchar. alb., ℔. j. in f℥xviij of the solution, and liquefying by a gentle heat. We have thus f℥xviij of syrup; consequently fʒj will contain 2·25 grains.

SYRUPUS FERRI IODIDI.

℞ Iodine	grs. 362
Ferri limaturæ	grs. 90
Aquæ distillat.	℥viij
Sacchar. alb.	℔j.

Digest the iodine and iron in the water until it become nearly colourless; pour off the clear liquid, and dissolve the sacchar. alb. with a gentle heat. When cold, pour off the clear syrup, and keep it in half-pint bottles, well corked, and in the dark. The deoxydising agency of the sugar renders it unnecessary to keep a piece of iron wire in the bottle, as no precipitate takes place, except when exposed to a strong light, and air combined. In this, 362 grains of iodine combined with 80 grains of iron, forming 442 grains of ferri iodidi, dissolved in water ℥viij, which by the solution of the sacchar, alb., ℔j makes ℥xviij, being three grains of ferri iodidi in fʒj of the syrup.

DESICCATIVE CERATE.*

In cases of gangrenous wounds caused by a prolonged decubitus, Thon recommends the topical employment of the following preparation:—

℞ Cocoa nut oil	32	grammes.
Spermaceti	32	,,
Wax	16	,,
Trisacetate of lead	8	,,

Mix.

EMPLOYMENT OF PROTIODIDE OF MERCURY IN SCROFULOUS DISEASES.*

BY DR. CARRÉ, OF METZ.

From the success which Dr. Carré has met with in the use of this powerful medicine in his own practice, he recommends it to the attention of the profession, not only for resolving scrofulous tumors, whatever may be their situation, but also for facilitating the cicatrisation of the ulcers which they so frequently determine, and which often obstinately resist the most methodical treatment.

The mode of employment adopted by Dr. Carré is that of frictions; and for this purpose he prepares an ointment composed of from 60 to 90 centigrammes of protiodide of mercury to 32 grammes of well washed lard.

The frictions should be made twice a day with from 2 to 4 grammes of the ointment at each time, according to the constitution and degree of sensibility of the patient; for the employment of this energetic agent demands the greatest prudence on the part of the practitioner, and its application must be slowly and very gradually proceeded with.

SULPHURIC ACID A PREVENTIVE OF LEAD COLIC.†

BY E. W. BENSON, MANAGING DIRECTOR OF THE WORKS, BRITISH WHITE LEAD WORKS, BIRMINGHAM.

Soon after the establishment of the British White Lead Works, and for some succeeding years, the lead colic prevailed amongst the workmen to a very distressing extent. The usual precautions were adopted of providing the workmen with gloves, and of enforcing strict attention to cleanliness on their part, ample means for this purpose being at the same time supplied, the men also being caused to change their working dresses on leaving their employment. Effective means, moreover, were adopted for carrying off the dust which arises in some of the operations, thus preventing as much as possible the inhalation of particles of white lead suspended in the air. The work-people had also a regular medical attendant provided by the proprietors of the works.

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* *Arch. der Pharmacie.*

* *Bulletin de la Société de Médecine de Toulouse.*

† From *The Lancet.*

Notwithstanding the precautions thus adopted, the observance of which was carefully enforced, some of the work-people were constantly suffering from illness, and in the hot season the number of cases of colic much increased.

The copious use of treacle beer has been considered at many white lead works to be serviceable, to some extent, as a preventive of this malady, and the beverage was supplied *ad libitum* in our establishment.

I met with a statement some time since, that "sulphuric lemonade" has been successfully used at a white lead manufactory in France as a preventive of the injurious effects of white lead; and it occurred to me that by adding *sulphuric acid* to the treacle-beer then used by our people, its supposed efficacy might be tested. This idea was carried into effect in the summer of 1841, and the results have proved most gratifying, as, although during several weeks after the addition of the sulphuric acid to the treacle beverage, little advantage seemed to be derived, yet the cases of lead colic became gradually less frequent, and since October of that year, or during a period of fifteen months, not a single case of lead colic has occurred amongst the people.

As no other change has taken place in the circumstances under which these men are placed, nor in the influences to which they are exposed, I can attribute this gratifying result only to the employment of sulphuric acid, which I conceive produces its effect by converting the highly poisonous carbonate of lead into the innocuous sulphate of lead. I am therefore anxious that the work people employed at other manufactories should be protected by the means which have been found so perfectly effective in this establishment.

It will be seen by the annexed formula that bicarbonate of soda is also added to the treacle beer, and that, consequently, sulphate of soda is produced, but the proportions of soda and sulphuric acid are such that rather less than one half of the sulphuric acid becomes neutralised. The object in adding the bicarbonate of soda is to give a pleasant briskness to the beverage.

FORMULA FOR PREPARING THE SULPHURIC BEER.

Take of *treacle*, 15 lb.; *bruised ginger*, ½ lb.; *water*, 12 gallons; *yeast*, 1 quart; *bicarbonate of soda*, 1½ ounce; *sulphuric acid* (oil of vitrol), 1½ ounce, by weight.

Boil the ginger in two gallons of water; add the treacle and the remainder of the water, hot. When nearly cold transfer it to a cask, and add the yeast to cause fermentation. When this has nearly ceased, add the sulphuric acid, previously diluted with eight times its quantity of water, and then add the bicarbonate of soda, dissolved in one quart of water. Close up the cask, and in three or four days the beer will be fit for use. As acetous fermentation speedily takes place, particularly in hot weather, new supplies should be prepared as required.

ASSOCIATION OF SULPHATE OF QUININE WITH CARBONIC ACID IN THE TREATMENT OF MARSH FEVERS.

BY DR. MEIRIEU.

I HAVE for many years practised in a marshy country, where intermittent fevers are endemic. I have given quinine in all its forms; but in certain cases, seeing that sulphate of quinine did not answer my purpose, I associated this salt with carbonic acid, in order to combat with greater advantage, the effects of the marshy infection which are complicated by a spasmodic state of the stomach; in this view, I make a mixture of tartaric acid, sulphate of quinine, bicarbonate of soda and sugar. I have administered this aërated febrifuge powder, while effervescing, in the interval between the fits, after having dissolved it in half a glass of water: the patients take it without repugnance, and the fits ordinarily disappear after two or three doses.

I have observed that sulphate of quinine, rendered soluble by sulphuric, tartaric, or citric acid, acts with greater energy, even in a smaller dose, than ordinary sulphate of quinine.

The following are the directions for preparing the powder:—

℞ Tartaric acid . .	9 grammes.
Sulphate of quinine .	10 centigr.

Triturate well and add to the mixture—

Bicarbonate of soda .	1 gr. 20 centigr.
Powdered sugar . . .	2 grammes.

For one dose to be taken in half a glass of water, at the moment of effervescence, or else the two mixtures may be separately dissolved in 30 grammes of water, and the solutions mixed and drunk at the moment of effervescence.

The following is the composition of this gaseous febrifuge :—

Sulphate of quinine .	10 centigr.
Tartaric acid . . .	4 grammes.
Bicarbonate of soda .	5 ,,
Powdered sugar . .	30 ,,
Water	1 litre.

Care must be taken first to introduce the sugar into the bottle, then the quinine dissolved in tartaric acid, and immediately afterwards the bicarbonate; the bottle must immediately be hermetically sealed to prevent the escape of gas. It may be taken in the dose of half a glassful or a glassful every two hours.

TREATMENT OF CHOLERA.

Mr. Whiteley furnishes us with the following case. Mr. H., a visitor, aged 60, of a debilitated constitution, was seized one Sunday with violent purgings, accompanied with frequent acts of vomiting. The evacuations were of a brown, serous character, and destitute of the least fæcal odor. On visiting him an hour after the attack, I found his countenance of a dark livid hue, bedewed with moisture, and extremely anxious; pulse exceedingly weak; extremities of an icy coldness, and suffering severe cramps. Ordered—Chalk mixture, with aromatic confection and tincture of opium, ʒss. Make a draught, to be taken every two hours. Heat and friction to be applied to the legs and feet. The medicine was instantly ejected from the stomach, and the effort consequent thereon produced increased exhaustion. I now administered stimuli in the form of brandy, with hot water, and one drachm of laudanum. The change was instantaneous. The vomiting and purging ceased; cramps abated; pulse became fuller and stronger; so that after a few doses of calomel and opium, to guard against any after symptoms, he quite recovered, and left for town on Friday.

NEW TREATMENT OF NEURALGIC PAINS.*

BY DR. MEISSNER.

Dr. M. advises the external employment of croton oil in headach and prosopalgia dependent on a rheumatismal cause. He applies this oil, in the dose of one or two drops, in frictions behind the ear of the side affected, and he repeats this application as often as necessary.

TREATMENT OF SOME INTESTINAL DISEASES.*

BY DR. SEIDLITZ.

Dr. S. uses castor oil as a specific in dysentery. He commences by administering it in the dose of a spoonful about every three hours.

He also praises, as superior to every other medication in tenesmus, the use of enemata with carbonate of magnesia or powdered charcoal.

TREATMENT OF CHANCRES BY SULPHATE OF COPPER AND CYANURET OF MERCURY.†

BY DR. STROHL.

There is so much the less to be apprehended from the secondary symptoms of syphilis as the primary symptoms of this affection have been combated with greater promptitude. This object is most easily attained by cauterisation. However, circumstances sometimes occur in which this method is not applicable, for example, when the ulcer is of very great dimensions, or very much inflamed, &c.

In these cases, Dr. Strohl employs sulphate of copper. He dresses the ulcers, five or six times a day, with lint saturated with a solution of about 75 milligrammes of this salt in 30 grammes of water. Simple chancres, treated in this manner, are ordinarliy cured in the space of twelve days.

Dr. S. affirms that complicated chancres may be cured in the same time, by using the following ointment :—

℞ Cyanuret of mercury. 10 centigrammes.
Lard . . . . . 4 grammes.

Mix accurately by trituration.

This ointment is spread on cloths whose size should be proportionate to the extent of the ulcers. At the commencement of this treatment, the pain it occasions is often so great as to render it necessary to remove the cloth at the end of an hour or two, and to apply a milder. However, it must be observed that it is more particularly after half an hour or an hour from the application, that the pain arrives at its highest degree of intensity, and that afterwards, at the end of two or three hours, it often entirely ceases.

If the chancre is very tense and very

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* *Schmidt's Jahrbücher, &c.*, No. 5, 1842.

* *Zeitschrift für die Gesammte Medicin*, July, 1842.

† *Oester. Med. Wockenschrift*, No. 18, 1842.

painful, after an application varying from four to six hours, according to the sensibility of the patient, this ointment may be replaced by mercurial ointment or ceratum opii.

When the edges of the chancre are sunk down, when its bottom has become more clear, the pain less acute, and the suppuration normal, which may happen after the first application of the cyanuro-mercurial topic, and should not be later than the fourth, the treatment may be finished by sulphate of copper.

THERAPEUTICAL EMPLOYMENT OF THE SPARTIUM SCOPARIUM.*

BY DR. KAUSER.

Dr. K. employed, with sussess, the infusion of the *Spartium Scoparium*,† in the dose of two cupfuls three times a day, in several cases of humid eruptions which had overrun the whole surface of the body.

He likewise speaks highly of its use in chronic purulent ulcers of the lower extremities, and, generally, all affections of a strumous nature. But, he states that, to derive all possible advantage from this medicine, it is indispensable to continue its use for at least ten or fifteen weeks.

TREATMENT OF ERYSIPELAS.‡

BY DR. WATSON.

Erysipelas, says Dr. Watson, is another of the diseases concerning the treatment of which there has been, and there is, a most embarrassing difference of opinion. I think, the more you see of this disease, the more convinced you will be that it is not to be cut short by any particular mode of treatment; that it will run a certain course; and that it will generally terminate, sooner or later, by resolution, whether remedies be employed or not. It does not follow from this that remedies are of no use; but it does follow that we are to exhibit them, not with the view of curing the disorder, but with the view of conducting it safely to its termination. If you look at the history of erysipelas, and of the notions which have prevailed respecting it, you will find that the opinions in favour of giving support, and of abstaining, as much as possible, from the abstraction of blood, greatly preponderate. In the outset of the complaint, if the pulse be hard as well as frequent, and there be much headache, and active delirium, you must take blood either from the arm or from the neck by cupping, or by leeches from behind the ears. But (I speak of the disease as it occurs in London) the time for this kind of practice soon passes by; and when you do bleed from the arm you must (in this town) bleed with caution, and in the upright posture; that the desired effect may be produced by the abstraction of the smallest quantity of blood. In all cases, it will be right to purge the patient briskly at the commencement. A full dose of neutral salts, or of rhubarb and magnesia, will answer better, I think, in these cases, than calomel and senna. If you see the patient very early, and if there be any nausea or oppression of the stomach, it will be proper to administer an emetic. In most instances you will soon perceive evidence of great debility; a feeble as well as a frequent pulse; tremors; a dry and brown tongue often. And these symptoms increase, if you then persist in drawing blood. The carbonate of ammonia does great good sometimes in such a condition; and this I am very much in the habit of giving. The bad cases of erysipelas are apt to baffle us all. I am not aware that I lose more of them than my neighbours. Speaking generally, a large majority of my patients get well; but I do not bleed one patient in a hundred from the arm. Dr. Fordyce, Dr. Wells, Dr. Heberden, all men of great sagacity and experience, recommend the treatment by bark. Dr. Jackson, an American physician, advocates, I see, the same plan. He says, that after a purge, and, if necessary, an emetic, the sulphate of quina should be given in as large doses as the patient will bear; and that from 12 to 25 grains in the 24 hours will generally suffice; and that we may know when the dose is sufficient by a buzzing which comes on in the ears. Dr. Elliotson, also, whom I here quote the more willingly because I think he is rather of an antiphlogistic turn than otherwise, in general, says, that he has never seen quina do harm, even in active tonic erysipelas; and that in doubtful cases, when you hesitate whether to bleed and put the antiphlogistic plan in force, or to stimulate and support, the quina is always a safe and eligible medicine. Dr. Williams, of St. Thomas's Hospital, thinks better still of wine, which he gives in all cases from the very beginning. I have hitherto limited my observations to erysipelas of the face and head as it occurs in London; and I have done so because I really believe that in the purer air of the country, and in young, strong, vigorous country persons, bleeding may be proper and requisite. You will find country practitioners pretty well agreed on this point.

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* *Arch. der Pharmacie.*

† Common Broom.

‡ As given in *The Medical Times.*

But, taking the disease as I see it here, I should say that many cases do well with but little care or interference from medicine; that many also, but a fewer number than the former, prove fatal under whatever plan of treatment may be adopted; and that many patients are to be saved by judicious management, who would otherwise die. The first requisite for rescuing these perilous, yet recoverable cases, is that they should be perpetually watched and tended. The indications of treatment may alter from one hour to another, and it is only by great vigilance on the part of the medical attendant, and on the part of an intelligent and obedient nurse, that medicine obtains its full chance of bringing the patient through. After clearing out the alimentary canal, then, I would not be active in either way, unless I saw some plain indication for activity. If the pulse became weaker, and I did not feel sure about the propriety of stimulating, I would give five or six grains of the carbonate of ammonia every four hours, and beef-tea. If the disease went on smoothly under that treatment, well and good. If the powers still continued to sink, I should have recourse to wine, or to both bark and wine; but of the two, I am more friendly to wine; and, as the patients like it better, you may be more sure of their taking it. If, on the other hand, there was much head-ache, and the pulse was hard, and the febrile distress great, I should apply a few leeches, and prescribe the tartarised antimony in a saline draught. The bowels should not be suffered to become confined; but the mild aperients are better than the drastic in these cases. Of all local appliances, that which, according to my own observation, is the most useful, and which affords the greatest comfort to the patient, is fomentation by flannels wrung out of a hot decoction of poppy-heads. But in order to give this, also, fair play, it should be continual: not used for half an hour, and then intermitted; but it should be one person's business to apply the fomentation assiduously as long as it is soothing and grateful to the patient. In a few cases, and but a few, the warm applications have been disliked, and cold lotions preferred; and when such is the case, there is no risk incurred by using them, so far as I know; no hazard, I mean, such as you may read of, of the inflammation being repelled from the surface, and driven in upon some vital organ. The local treatment most in favor with our apothecary at the hospital is that of covering the inflamed face and head with flour, by means of a dredging-box. The patients declare that the flour cools, soothes, and comforts them. Now this is a more convenient, and, in some respects, a more eligible application than that of hot flannels. It is less likely to fail of its purpose through the negligence of the nurse.—[Dr. Watson insists, supported by strong evidence we consider, on the contagiousness of erysipelas.—Ed. Med. Times.

CURE FOR HYDROPHOBIA.*

At Udina, in Friule, a poor man lying under the frightful tortures of hydrophobia was cured with some draughts of vinegar, given him by mistake, instead of another potion. A physician at Padua got intelligence of this event at Udina, and tried the same remedy upon the patient in the hospital, administering to him a pound of vinegar in the morning, another at noon, and a third at sunset, and the man was speedily and perfectly cured.

POISONING BY ARSENITE OF COPPER.†

BY DR. LEWINSTEIN.

A child, aged about twelve months, ate some portion of a cake of green ink, unperceived by his parents. Suddenly, vomitings supervened, and the mother could distinguish some small pieces of this ink amongst the rejected matter, which were of a whitish color and of a slightly viscid consistence. Dr. Lewinstein was immediately called in, and found the child reposing in its mother's arms. The abdomen was neither tumefied, nor painful; the pulse was not more frequent than it generally is at this age; the eye was clear; the face calm and colored, without any convulsive motion. However, every five minutes vomiting occurred, which, each time, caused the rejection of small particles of green ink. Afterwards, the vomiting appearing to relax, an emetic composed of powder and syrup of ipecacuanha was administered, which the child swallowed without difficulty. In the intervals, white of egg diluted with water, and properly sweetened, (a drink which the little patient took in large quantity and seemed to drink with pleasure,) and milk, were alternately administered. But the scene very soon changed; the child began to cry, the countenance became pale and emaciated, the eyes comatose, the abdomen flatulent without being painful, the pulse acquired greater frequency, and the skin became cold; finally, the child refused to take any thing, probably from the impossibility of operating deglutition, and remained in a state of complete prostration in the arms of its mother.

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* *The Times*, Dec. 9, 1842.

† *Wochenschrift für die Gesammte Heilkunde*, No. 32, 1842.

During this time, an apothecary, Mr. Becker, had ascertained the true nature of the green ink which had caused these symptoms, and found that it was composed of arsenite of copper. In this case the child would not swallow any chemical antidote, and it was necessary to adhere to the above-mentioned means. A copious diarrhœa very speedily supervened, at the end of which the child recovered.

POISONING BY CYANURET OF POTASSIUM.*

The Cour Royale of Rennes was, on the 13th ult., and the 1st and 7th inst., engaged in hearing an appeal against a judgment of the Correctional Tribunal of St. Malo, under the following extraordinary circumstances:—

On March 30th, a M. Lessechop died suddenly, with all the symptoms of having been poisoned. As he had been lately dismissed from an employment which he held under the Ponts-et-Chaussées, on the works going on at the floating dock of that port, it was at first attributed to an act of suicide from chagrin. Very soon afterwards, however, a report got abroad that his death was occasioned by a medicament imprudently administered to him by M. Macé, a physician who had been settled at St. Malo about twelve months. An inquest was taken, upon which M. Macé was brought before the Correctional Tribunal, and sentenced to pay a fine, on being convicted of involuntary homicide. Against this decision the public prosecutor and M. Macé both appealed. On this new trial the facts were more minutely gone into, and, according to the testimony and pleadings, appeared to be as follows:—On March 9, M. Macé took to M. Piel, a chemist, a prescription for M. Lessechop, of 4 grammes of cyanuret of mercury, to be made up into 12 pills. On observations made by the chemist as to the powerful effects of this preparation, M. Macé at first substituted cyanuret of potassium, and afterwards iodide of potassium, for the cyanuret of mercury. On the 29th of March the physician went again to the chemist with a prescription of 4 grammes of cyanuret of potassium, to be infused into 60 grammes of orange flower water, and 15 grammes of syrup; one spoonful of which was to be taken three times a day. The patient took but one spoonful, for he expired in three quarters of an hour after having swallowed it. On an autopsy being taken, the entrails exhibited symptoms of organic disease which tended to shorten life, but could not have caused a death so sudden. No trace of the cyanuret of potassium could be found in the body; but it was evident that one spoonful of the mixture had been taken out of the bottle, and three eminent chemists, to whom the remainder had been submitted, deposed that the cyanuret contained in it was chemically perfect; that several strong and healthy animals, to which a quantity equal to that taken by M. Lessechop had been given, mixed with food, died almost immediately afterwards; and therefore it was to be inferred that the death of the patient of M. Macé was occasioned by the medicament administered to him. The accused party endeavored to repel the charge against him, by asserting that the deceased, who had himself studied medicine, had suggested the use of cyanuret of potassium; and further, that the quantity intended to be taken at a time was only a tea-spoonful, whereas M. Lessechop had swallowed a table-spoonful. He added, that he had also ordered that each spoonful should be taken in a cup of milk,—a direction which had not been followed. To this last point it was replied, that milk newly drawn from the cow is alkaline, and could not either have increased or diminished the poisonous quality of the cyanuret of potassium—that soon after milk is in contact with the air it undergoes lactic fermentation, and becomes acid. In this state it may have some of its hydrocyanic acid displaced by the lactic acid, and then would form, in one case, lactate of potassium, and, in the other, a certain quantity of hydrocyanic acid, which would remain in the milk, the action of which acid would be as powerful as the cyanuret of potassium. If the milk be boiled, the hydrocyanic acid would evaporate, and the poisonous action be greatly lessened. To questions put by the president, the chemists stated that the cyanuret of mercury, first prescribed by M. Macé, was a less violent poison than the cyanuret of potassium, which he first substituted for it, and much less than the iodide of potassium. The Cour Royale confirmed the judgment of the Correctional Tribunal, but changed the penalties into a fine of 50 f. with three months' imprisonment, and an additional twelve months, on non-payment of the fine and the costs of the prosecution.—*Galignani's Messenger.*

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* *The Times*, Dec. 20, 1842.

ADULTERATION OF POWDERED ALUM.

To the Editors of The Chemist.

Gentlemen,—

Knowing that the columns of your valuable Journal are open to the publication of the various frauds that are practised on the public, I beg leave to call your attention to the following adulteration that came to my knowledge a short time since.

A customer went to the shop of a druggist, (in a market town,) and inquired the price of powdered alum per stone; he was told 2*s.* 6*d.*—at which he expressed his surprise, saying, "he could purchase it at 1*s.* 9*d.*," mentioning where. The druggist said, "he wished he would get him a sample," which he did; and upon being analysed, it was found, that of seven pounds which were sold for powdered alum, four only were alum, the other three being common salt.

Perhaps it may be argued, that salt is not injurious;* still, as you are desirous of giving publicity to the various frauds that are carried on, if you think this worth insertion in your Journal, I hope you will publish it; and should it come under the notice of the person who thus sells salt for alum, let it be a caution to him in future, as the next time, perhaps, his name may be exposed.

I am, Gentlemen,
Respectfully yours,
C. D.
A Subscriber and Constant Reader.

ON THE DEBASING COMPETITION OF CHEMISTS AND DRUGGISTS.

To the Editors of The Chemist.

Gentlemen,—

As a Member of the Trade, (I wish it were, and hope it will shortly be, elevated to a profession,) I cannot help feeling indignant at the lowering and disreputable practice adopted by many of the chemists and druggists in the "great metropolis," of inviting the public to those shops where they can obtain the *cheapest* dose of physic! how debasing! To prove that the term I apply is peculiarly proper, I will quote my authority, when, I trust, if it should meet the eye of those for whom it is intended, that they will benefit therefrom:—

"Debase, *v. a.* To reduce from a higher to a lower state; to sink into meanness; to adulterate; to lessen in value by base admixtures."—Vide *Walker's Dict.*

Of course, the parties alluded to are your "cheap," advertising druggists, of bill-distributing notoriety, whose shops are plastered with tickets, and whose residences, the newspapers inform us, are to be found amongst the Islingtonians, the Clerkenwellers, and the East-enders! These are the parties who are daily injuring the respectability of the trade; they are, in my estimation, little better than those "flat-catching" empirics, whose foul productions meet us at the corner of every street, blasting the virtuous mind with, as it were, a moral pestilence.

Do, therefore, Gentlemen, exercise your legitimate functions, by using your pen to regenerate those who have so far run amuck as to require a little flagellation; advise them henceforth to cease their mean, paltry, pettifogging system, which, though it *perhaps* gets a little pelf, detracts so greatly from the respectability of the profession!

I am, Gentlemen,
Respectfully yours,
Dec. 15, 1842. Patrioticus.

["Patrioticus" does not surpass us in contempt for the pitiful wretches who disgrace their calling: to attempt their regeneration is hopeless; good cannot be produced from that which is bad. To have remedied this, was a portion of the duty (like the remainder, neglected) of the Pharmaceutical Society. We will seek every opportunity of exposing this and other evils.]

MESSRS. BEWLEY AND EVANS'S AQUA CHALYBEATA.

We have received from Messrs. Bewley and Evans, of Dublin, a bottle of a ferruginous preparation thus designated, accompanied by a pamphlet, setting forth the various objections to the old preparations, and the superior virtues of the one under consideration.

It is a most elegant, and, we have every reason to believe, a most efficient preparation; it will enable medical men to administer iron to patients who have a great repugnance to the ferruginous taste, almost without their being aware of it. So pleasant is it to the palate, that, when we tasted it, we had almost taken more of it than was prudent. Messrs. Bewley and Evans will come in for a large share of the gratitude of the ladies, for whose diseases this medicine is especially intended.

We cordially recommend it to patients and medical men, and the latter may depend on always being applauded for sending "such nice physic."

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* That must depend on the purpose for which it is required; in many cases it would be highly injurious.—Eds. Chem.

We have also received a letter from an esteemed Correspondent, on the subject of this "Aqua Chalybeata," the chief object of which is to complain of the price at which it is sold, at the same time speaking highly of it. He will perceive that his object is hereby answered as well as if we inserted his letter, and that we are thus enabled to save space without any prejudice to him. At the same time, we may observe, that those who will have a medicine divested of all objectionable qualities ought to pay for it, and must not grumble if, in making physic-taking a luxury, those who use their ingenuity to supply their wants make that luxury a source of profit.

IV. REVIEWS AND NOTICES OF BOOKS.

As the Reviewing of Books, British and Foreign, forms a very considerable and important feature in The Chemist, we shall for the future devote to that department a distinct portion of this work, believing that it will be more convenient to our readers than the plan which we have hitherto followed, of distributing them, according to their nature, among the other divisions.

We intend to pay increased attention to this branch of our duty, and, as we have ever done, to review every work impartially and fairly, and according to its peculiar merits or demerits. We are determined to preserve to The Chemist its high character as an authority on this and every other point.

The Reviews will always be most studiously and carefully written, and will be rendered as useful and interesting as possible to our readers, and the extracts, which will be given whenever practicable, will be judiciously selected.

The attention of authors is also particularly called to this department of the work. We shall never object to returning to the author or publisher any work, a review of which would be unsuited to our pages, whenever a wish to that effect is expressed.

CHEMICAL MANIPULATION: *being Instructions to Students in Chemistry on the Methods of performing Experiments of Demonstration or Research with Accuracy and Success.* By Michael Faraday, D.C.L., F.R.S., F.G.S., M.R.I. Third Edition, Revised. London: John Murray, Albemarle Street. 1842.

Of a work which has already passed through two editions, which has long occupied no ordinary position in chemical literature, and which is the production of so eminent a chemist and so skilful a manipulator as Dr. Faraday, but little is required of us in the shape of commentary. Nor need we use much eloquence in recommending it to the student who is animated by the laudable desire of attaining dexterity in the performance of chemical operations; his wants will indicate to him the necessity of his making it his chief counsellor in the laboratory.

Nothing could be more opportune than the republication of this work. Since the last edition has been out of print, chemistry has been studied much more extensively than previously, and, consequently, the want of a book giving full and explicit directions in all branches of chemical manipulation has been severely felt by those who, from the late period at which they commenced the study of chemistry, were not fortunate enough to obtain a copy of the second edition. They will now gladly avail themselves of the opportunity of possessing so inestimable a treasure.

But if we are rejoiced at the appearance of this work as affording increased facilities for the acquisition of a thorough practical acquaintance with chemical manipulations, we feel as great pleasure in the indication it presents that its talented author is so far reinstated in health as to be able to resume labors which had ceased, happily only for a time.

Possessing, as he does, in the highest degree, a mind capable of grappling with the greatest difficulties in science, to which it has never been directed without displaying a power of surmounting them seldom surpassed,—this eminent chemist has deemed it not beneath him to smooth the path which the student has to pursue in the acquisition of knowledge. Ever ardent in the pursuit of investigation, he has in this work opened to the rising generation of chemists his own vast stores of knowledge, leading them, by an easy route, to a proficiency to which, otherwise, it would have occupied them many years of labor to attain. His own distinction has long since been obtained, and his name, which, wherever chemistry is cultivated, will be regarded with respect, —ranks among the most illustrious contributors to science since his immortal predecessor, Davy. He may now, with Horace, say, "*exige monumentum aere perennis*," and rest satisfied that he has little to fear or hope from censure or from praise.

To those who are unacquainted with the work, and our younger readers in particular, the following extract, from the introduction, which we insert, believing that the author's own words will be his best review, will serve to indicate its nature:—

"Another consequence of skilful manipulation is, that by its means a train of research may frequently be carried much further than its original object, and that in two ways. In the first place, the occurrence of clear and distinct phenomena, besides illustrating satisfactorily the direct object of inquiry, frequently suggests to the mind collateral views, which, pursued and extended, terminate in additional chains of information and discovery; whereas, if the experiments be less clear, though sufficient may be distinguished to satisfy the mind on the subject in question, nothing more is done, and the progress of knowledge is stopped. In the second place, the operations may be performed on comparatively very minute quantities; and that which in the hands of one person had hardly sufficed to supply very general information of its nature, may, in those of another, be made to yield matter for a full and minute investigation, terminating in the developement of its nature and habits, with a perfection equal to that obtained with the largest masses. Frequent illustrations of the importance of manipulation in thus effecting all that can be desired with small quantities, is afforded in the occasions that arise in testing for arsenic; for the fractions of a single grain will, in the hands of some persons, afford the striking and convincing proofs, whilst many grains will, with others, present no satisfactory conclusion.

"When the substance under examination is rare (and that is frequently the case, both in natural and artificial productions), the facility of working with small quantities is of the highest importance, or otherwise the opportunity of gaining information may be entirely lost, or, if preserved, is retained only at a great expense. There existed in the British Museum a small fragment of a black stone, the source and history of which were unknown; it was unique, no other specimen being in the Museum, or known to be in existence; yet, as it presented some peculiar characters, Mr. Hatchett was induced to examine it, and working with a portion of the stone weighing not more than 200 grains, he was enabled to discover in it a new metal, which he distinguished by its various characters from all those previously known, and which he named Columbium. Ekeberg afterwards discovered a metal which he named Tantalium, conceiving it to have been observed and distinguished for the first time by himself; but Dr. Wollaston, who examined and compared it with Columbium, was able to identify it with that metal, although he had not more than five grains of the stone from the British Museum, upon which to make his experiments.

"Finally, habits of correct and delicate manipulation very much facilitate experimental inquiries at all times. It is not in difficult researches only that it is desirable, but even in such common operations as testing for lime, or iron, or sulphuric acid, its advantages become manifest; for either time is shortened, or the apparatus considered as necessary is diminished, or effectual substitution is made for those that may be wanting; and thus the experiment becomes easy, where otherwise it would be considered as impossible. Besides facilitating such inquiries, it also diminishes the expense both in materials and apparatus, and it produces beneficial habits in the mind, by exercising it both in invention and perception, even in this subordinate part of its operations. 'Nothing,' as Dr. Johnson observes, 'is to be considered as a trifle by which the mind is inured to caution, foresight, and circumspection. The same skill, and often the same degree of skill, is exerted in great and little things.'

"The importance of instruction in manipulation was long felt by the author during his experience in the Royal Institution of Great Britain; and the deficiency in the means of teaching it induced him to think he might perform an acceptable service by putting together such information on the subject as there was reason to suppose would be generally useful to the student. No book contains those minute directions which are necessary in the present extensively cultivated state of the science; nor can verbal instructions teach that perfection of manipulation, which is only to be gained by constant operation. But there is so much that can be taught, so much that can be suggested by such instruction, that it seems extraordinary not one of the many treatises upon Chemistry has been devoted to this subject, especially when it is considered, that of the great numbers who now desire, or are assumed to have, some knowledge of chemistry, very few have access to competent practical sources.

"Such are the considerations which have given rise to the present work, and under their influence it has been composed. The object of the volume is to facilitate to the young chemist the acquirement of manipulation, and, by consequence, his progress in the science itself. It does not attempt to inculcate the *principles* of the science, but the *practice;* neither does it claim to teach *a habit of reasoning;* but has solely in view the *art of experimenting;* and though sometimes it may be necessary to speak of the properties of bodies, or to draw conclusions, it will always be done in subordination to the main object. The volume, indeed, is not intended to supply the place, or imitate in its nature any one of the numerous and useful works on Chemistry now extant, but to be rather an accompaniment to all of them,—supplying that portion of knowledge which, however essential to the pupil, was not of a nature to consort with their more scientific contents.

"In the pursuit of this object it is intended to describe:—

"The conveniences and requisites of a Laboratory.

"General Chemical Apparatus, and its uses.

"The methods of performing Chemical Operations.

"The facilities acquired by Practice; and

"The causes which make experiments fail or succeed.

"Although a laboratory will be described in a complete state, well appointed, and with most of the conveniences that the author is acquainted with, yet it is intended that the directions shall be such as to enable the experimenter to perform the operations, when desirable, with the smallest number of requisites; for, though many may wish to be acquainted with all that is useful, yet to a much larger number of persons a knowledge of the few essentials is of the greatest consequence. To omit the description of a laboratory, in a work devoted to chemical experiment, would of course be improper; but it would certainly be a much greater error to omit showing, as far as the author's knowledge will serve him, how many things may be dispensed with in cases of necessity, and how few are the absolute requisites for the greater number of operations. The general principles upon which apparatus is formed will be inculcated, for the purpose of leading the student to the *ready substitution* of one thing for another, and to that *contrivance* by which the wants of the operator may be obviated; and therefore *small, temporary,* and *generally useful* apparatus will be pointed out as often as possible.

"It is not intended to describe processes particularly, such as preparations of each of the acids; or of the alkalis, or of other important substances; or such as are numerous in the chemical arts, though reference to them will probably be frequent. The work is intended principally to assist in obtaining a knowledge of the chemistry of research, and not the chemistry of the arts, or rather, not of the ultimate and refined processes of chemical preparations; otherwise than as, the principles being the same, the instruction which is advantageous in the one case will be useful in the other. The book is principally for beginners; but this will not induce the author to reject as improper, any information he may have to give relative to the facilities of making experiments, though they may relate to the production of refined and abstruse results. Lastly, it may be remarked, that it is intended for a country where most of the requisites are supplied in trade.

"Professedly disclaiming a scientific character, the arrangement of the volume is one of mere convenience, but it has not been adopted without considerable thought. As the work was not intended to teach the principles of Chemistry, but to be a useful laboratory companion, that arrangement was considered the best, which, though not scientific, seems most convenient for including the different parts of manipulations without any great violence to the relation of the whole subject. It has therefore been divided into *sections,* or principal divisions: but the professed object of each has not always been strictly adhered to, since it has often been found convenient and useful to include information on other points, which nevertheless have always some degree of connection with the subject under consideration. Those who may read the work for instruction will probably not find many difficulties in the arrangement, particularly as they will be aided by a copious index.

"Such are the objects of the present book, and the means by which their attainment has been attempted. That it is faulty, the author has no doubt; indeed, he is thoroughly convinced it cannot be otherwise. It contains little more than a selection from the experimental practices of one person; and though in the more ordinary operations of Chemistry, the author's may resemble those of most other chemists, and therefore be well suited for general adoption, yet in those particular facilities that others may by practice have attained, it must necessarily be imperfect. Acquisitions of this kind made by any chemist must be in relation to his particular train of research; and as there are but few who possess the power of ranging through the whole of this extensive science, it cannot be expected that many could have perfect knowledge of the facilities belonging to all departments of experimental chemistry.

"Finally, he may observe, with reference to the pupil's expectations in consulting this book, that even supposing it were perfect, it could only point out the methods for him to *practise;* and therefore, though aided by the principles of the science detailed in other works, and the experimental directions in the present volume, he must still perfect his knowledge by study and the labor of his own hands."

HISTOIRE DE LA CHIMIE DEPUIS LES TEMPS LES PLUS RECULES JUSQU'A NOTRE EPOQUE; *Comprenant une Analyse Détaillée des Manuscrits Alchimiques de la Bibliothéque Royale de Paris; un Exposé des Doctrines Cabalistiques sur la Pierre Philosophicale; L'Histoire de la Pharmacologie, de la Metallurgie, et en Général des Sciences et des Arts qui se rattachent à la Chimie, &c.* By Dr. F. Hoefer. Paris: Hachette. London: H. Baillière, 219, Regent Street. Tome I. 1842. pp. 510.

Nothing can be more interesting to those acquainted with the science of Chemistry, in its present advanced state, than to look back at the opinions, and labors based on those opinions, of the early laborers in the same field. The superstition and the ignorance have now passed away; where, before, all was obscure and mysterious, all is now intelligible and open to all; the scientific laborer, then, too frequently, an impostor, is now a philosopher.

The work before us is, indeed, a most complete history of Chemistry; and one which, from the gratification and pleasure we have experienced in its perusal, we cordially recommend to such of our readers as are acquainted with the French language (and, in these days of enlightenment, who is not?). It is written in a fluent and elegant style.

Dr. Hoefer's excellent execution of his laborious and extremely difficult task evinces considerable learning and very extensive reading. The following extract from the preface will give some idea of the vast labor and great learning required in the preparation of this work:—

"I have been obliged, pen in hand, to analyse more than one thousand volumes in MS. as well as printed, written in more than six different languages, ancient and modern. It is impossible to imagine how tedious this work was, and how many researches were often required for discovering a pearl in an immense farrago of words,—*margaritam in stercore*, as Leibnitz said of the reading of some works of scholastic philosophy."

We regret that we are unable to present our readers with even a *morçeau* from the ample stores of this volume; but as its moderate price brings it within the reach of every one, this is the less needed.

In conclusion, we may observe, that it is by far the most complete work on the subject, and that no chemical library will be complete without it.

CHEMICAL EXPERIMENTS; *Illustrating the Theory, Practice, and Application of the Science of Chemistry, and containing the Properties, Uses, Manufacture, Purification, and Analysis of all Inorganic Substances. With Numerous Engravings of Apparatus, &c.* By G. Francis, F.L.S., &c. London: G. Berger, Holywell Street, Strand. 1842. pp. 250, in double columns.

This is a useful little work, and recommends itself by its cheapness, to those who cannot afford a more expensive one. It contains a great quantity of matter, being as closely printed as The Chemist.

To those who study chemistry as an amusement, it will be very serviceable, since it gives directions for the performance of a great number of very pleasing experiments. For this reason it will be found a very good work for intelligent youths, in whom it is calculated to engender a desire for a further acquaintance with the science of Chemistry, and to whom it would be a judicious New Year's Gift.

THE LONDON JOURNAL AND REPERTORY OF ARTS, SCIENCES, AND MANUFACTURES; *Containing the Specifications of New Patent Inventions.* Conjoined Series, No. CXXXII. Conducted by Mr. W. Newton. London: W. Newton, 66, Chancery Lane.

THE LONDON AND EDINBURGH MONTHLY JOURNAL OF MEDICAL SCIENCE. Edited by John Rose Cormack, M. D. London: Churchill. Edinburgh: Maclachlan and Co. Dec. 1842.

The first of these works has long enjoyed a high reputation among those connected with patents. The present Number contains the continuation (from the previous Number) of the important case of Brown *v.* Annandale and Son, which should be read by all interested in inventions, patented, or to be patented. It likewise contains specifications of recent patents, scientific notices, lists, for the month, of English and Scotch patents, and the celestial phenomena for December.

The second work, after a two years' progress in the favor of the medical profession, is, we perceive, about to commence a new series. We wish it a continuation of the success to which its high merit entitles it.

Its pages are adorned by many valuable contributions from eminent medical practitioners on the other side of the Tweed. The important original communications in the present Number are—Surgical Cases and Observations, by James Syme, Esq., Surgeon to the Queen.—A Case of Impetigo Sparsa, by Dr. B. R. Morris.—Cases illustrative of some unusual Forms of Dislocation, by Edward Parker, Esq.—Further Observations on the Chemical and Physical Characters of the Urine of Pregnancy, by Dr. J. W. Griffith;—and an Account of a Child with Encephalocele, and Extrophy of the Urinary Bladder, by D. J. Taylor, Esq. It is an excellent Number.

BOOK RECEIVED.

Lectures on Electricity, including its Applications in the Arts. By **Henry M. Noad**, Mem. Chem. and Elec. Socs. London. London: R. Hastings; Scott, Webster, and Geary. Parts X. XI. and XII.

[This completes the work. No. XII. contains a large table of the metals and their compounds with oxygen, chlorine, and sulphur, &c.]

TO CORRESPONDENTS.

A Young Tradesman, Exeter, had best furnish us with the means of addressing him privately. This answer was accidentally omitted from our last.

C. T. is thanked. It is not our fault. Will he favor us with his name and address?

Mr. Onion, and other correspondents who have written to us relative to the Chemical Society, are informed that we wrote, on the 14th ult., to that Society, a letter embodying their queries, not being in a position to answer them ourselves. Up to the time of this sheet going to press (Dec. 29), no reply has reached us. When we hear from the Society, we will communicate, through the post, with those who have given us their name and address; others will find an answer in our next.

A Constant Subscriber (P. C.), Exeter:—

Iodide of iron, gr. ij;
Simple syrup, ℥j.—*Ricord.*

Iodide of iron, gr. xxiv;
Simple syrup, ℥j.—*Dr. A.T. Thomsn*.

A Constant Reader.—Your paper may be sent to us for perusal, and, if adapted to our pages, it shall be inserted. Its title renders us doubtful.

Chemicus.—Use Alcohol. If you require farther aid, write again, with name and address, and we will communicate with you by post.

M. D. will receive a letter. He need not apologise for troubling us; we feel much pleasure in aiding the studies of the greatest novice (if he be not a dunce), and the investigations of the proficient.

H. H.—The parties alluded to are well known to us; avoid them in future!

D. has, in our opinion, been proceeding erroneously in his experiments. The limits which we are compelled to assign to Correspondents not admitting of our inserting such a lengthy reply as his question involves, he must send us an address to which we may direct a letter.

"**Querist**" is right.

Anti-Humbug. — Continue your antipathy to humbug. It is sometimes a formidable opponent.

A Bad Manipulator.—The publication of Dr. Faraday's *Chemical Manipulation*, reviewed in our present Number, enables us to answer this correspondent. We recommend that work to him.

"**A Poor Student of Chemistry**" will do well to buy Noad's Lectures on Chemistry (12*s*.). With respect to Electricity, we advise him to procure Sturgeon's *Lectures on Electricity* (5*s*.).

Dr. H. is referred to the article by M. Pelouze, in this Number.

"**A Discontented Member of the Pharmaceutical Society**" cannot expect to be otherwise than what he signs himself. He has found, like many others (whose letters to us are daily increasing to such an extent that one postman will not long be sufficient for Carey Street), that we were right. We are watching proceedings. Read our next Number.

Letters Received from "G. H. S.;" "A. B.;" Five signed "Constant Reader!;" Eight from "Subscribers!;" and "X.Y.Z."

ERRATUM IN THIS NUMBER.

Page 4, col. 1, line 24, *for* "these" *read* "their."

Nota' Bene.—*All Communications and Books for Review must be addressed, "To the Editors of the Chemist, Care of Mr. Hastings, Publisher,* 13, *Carey Street, Lincoln's-inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON THE NEUTRAL NITROGENOUS MATTERS OF ORGANISATION.*

BY MM. DUMAS AND CAHOURS.

(*Concluded from page* 15.)

VITELLIN.

Vitellin constitutes the albuminous matter of yolk of egg. It is easily obtained by treating boiled yolk of egg, reduced to a coarse powder, by ether, which removes the fatty matter. There remains an albuminous and colorless substance, coagulated, and consequently insoluble.

With hydrochloric acid, vitellin gives the same reactions as albumen or caseum, but it differs from them in composition, as has been ascertained by Jones, whose analysis very much agrees with ours.

The following are the numbers obtained by us:—

	I.	II.	III.	IV.	Mean.
Carbon	51·89	,,	51·31	,,	51·60
Hydrogen	7·07	,,	7·37	,,	7·22
Nitrogen	,,	15·02	,,	15·03	15·02
Oxygen, &c. . . .	,,	,,	,,	,,	26·16
					100·00

Whence the following very simple formula is deduced:—

$$C^{48} H^{37} N^{12} O^{15} + 3 H O,$$

which would give—

C^{48}	51·8
H^{40}	7·1
N^{12}	15·1
O^{18}	26·0
	100·0

LEGUMIN.

M. Braconnot has designated under the name of legumin a nitrogenous matter which he discovered in peas and beans: he pointed out its analogy with caseïn.

Liebig has recently made many analyses of legumin, all of which, without exception, agree in assigning to it a composition identical with that of caseïn. The following are the numbers:—

Carbon	54·14
Hydrogen . . .	7·16
Nitrogen . . .	15·67
Oxygen	23·03
	100·00

Thus M. Braconnot's presumption is justified, and everything seems to concur in proving the identity of albumen and caseïn.

The following facts prove that it must be thus:—

The legumin of peas, beans and lentils is more or less easily extracted by M. Braconnot's process. The bruised matter is put in digestion in tepid water for two or three hours. The product is rubbed in a mortar, in such a manner as to form a pulp to which about its own weight of warm water is added. After an hour's maceration, the whole is pressed through linen. The liquor, left to repose, allows a certain quantity of fecula to deposit. It is filtered to obtain it perfectly clear, and acetic acid, diluted with about eight or ten times its weight of water, is gradually added.

At the moment when the acid is added, a very white, flocculent precipitate is formed, which is easily collected on a filter, but the washing of which must be slowly performed, and is attended with some difficulty.

Too great a quantity of acetic acid must not be added; for legumin, being entirely soluble in that acid, the precipitate will then more or less completely disappear.

The legumin, exhausted by water, is afterwards washed with alcohol. After this treatment, it is dried, pulverised, and put in digestion with ether, which frees it from all fatty matter. It is afterwards again dried at 140° C. *in vacuo.* We analysed the matter thus prepared.

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* Sitting of the Academy of Sciences, Paris, Nov. 28, 1842, as given in *Comptes Rendus*, No. 22.

MEAN OF THE ANALYSES OF LEGUMIN.

	Legumin of Peas.	Legumin of Lentils.	Legumin of Beans.
Carbon . . .	50·53	50·46	50·69
Hydrogen . .	6·91	6·65	6·81
Nitrogen . .	18·15	18·19	17·58
Oxygen, &c. . .	24·41	24·70	24·92
	100·00	100·00	100·00

Proust, and after him Boullay, Vogel, and other chemists, have had their attention arrested by a matter which exists in abundance in sweet and bitter almonds. Proust and Vogel considered it as identical with the caseïn of milk.

More recently, Liebig has made a series of analyses of this product, from which he draws the conclusion that it is identical with the caseïn of the milk of animals. This conclusion does not coincide with our own results.

If we examine sweet almonds, the kernels of the apricot and the prune, we find in all these substances a product soluble in cold water, and susceptible of precipitation by weak acetic acid.

Nothing is more easy to obtain; for it is sufficient to put the pulp of almonds in maceration with cold water for one or two hours, and to filter. The solution which rapidly flows out contains large quantities of the matter precipitable by acetic acid. The precipitate given by this acid presents a pearly, sparkling appearance. It is very white. Its appearance is evidently owing to the concentration of the solutions; for, when once diluted with water, the liquor no longer produces a similar precipitate; it gives only a flocculent deposit.

MEAN OF THE ANALYSES OF LEGUMIN.

	Of Sweet Almonds.			Of Prunes.	Of Apricots.	Of White Mustard.
Carbon .	50·94	50·93	50·80	50·93	50·72	50·83
Hydrogen	6·72	6·70	6·71	6·73	6·65	6·72
Nitrogen	18·93	18·77	18·80	18·64	18·78	18·58
Oxygen .	23·41	23·60	23·69	23·70	23·85	23·87
	100·00	100·00	100·00	100·00	100·00	100·00

The matter of almonds, identical with legumin in its properties, possesses also its composition.

Indeed, if it contains more nitrogen than the other, we are inclined to think that it is owing solely to the difficulty of separating the legumin of peas and that of beans from every trace of gummy matter, before the legumin itself had undergone the commencement of spontaneous decomposition.

We do not for a moment hesitate, therefore, to regard the matter of sweet almonds as identical with legumin, considering, besides, the analysis of the product of almonds as more proper for representing the exact composition of legumin than that of the products extracted from the leguminous plants themselves.

There exists incontestably, therefore, a special nitrogenous matter abounding in vegetables, since it forms a part of all the leguminous grains which we have examined, and since it is found in the kernel of all the rosaceæ which we could procure, and, finally, as the grain of a crucifera presented it to us in large quantities.

This nitrogenous matter certainly performs a considerable part in the nutrition of some animals, and in that of man himself.

It was therefore necessary to study it with care, as much to characterise it as to ascertain by what peculiarities it differs from or resembles the other neutral nitrogenous substances of the vegetable economy.

Legumin, precipitated by dilute nitric acid from one of its concentrated solutions, is always presented with a pearly sparkling aspect; in flocks, from a weak solution.

It is insoluble in cold alcohol and in ether. Boiling water does not dissolve it; it is not soluble in boiling dilute alcohol.

Cold water, on the contrary, dissolves it in large quantities. When the liquid is raised to a temperature approaching the boiling point, it coagulates and deposits coherent flocks which much resemble coagulated albumen. Hence it results, that if an aqueous solution containing both legumin and albumen be operated on, and if the mixture be coagulated by heat, the product obtained will contain both albumen and legumin, which, by analysis, will furnish results intermediate between those which represent the composition of these two substances.

Concentrated acetic acid, put in contact with the pearly deposit, is absorbed by it, and causes it to swell up, becoming semitransparent. The resulting compound completely dissolves in boiling water. By evaporation, a substance of a gummy appearance, susceptible of redissolving in water, is obtained, and which possesses the composition of legumin, as is shown by the following numbers:—

Carbon	50·66
Hydrogen	6·74
Nitrogen	18·75
Oxygen, &c.	23·85

When dilute acetic acid is added to a solution of legumin, it immediately precipitates. An excess of acid redissolves the precipitate formed, and the liquid becomes clear, without the legumin acquiring the above-mentioned gelatinous appearance. By saturating the excess of acid with ammonia, the legumin is made to reappear and precipitate *de novo*. An excess of ammonia in its turn re-dissolves it.

We have paid particular attention to the action of hydrochloric acid. When dilute, it precipitates albumen, like acetic acid; when concentrated, it dissolves it, and the solution speedily acquires that violet blue tint which characterises the substances analogous to albumen. With legumin, the tint is very rich and very pure.

Dilute sulphuric acid likewise precipitates legumin. When concentrated, it also precipitates it. If dry legumin be triturated with concentrated sulphuric acid, it is slowly dissolved, and acquires a brown color, without producing sugar of gelatin; at least we did not recognise its presence.

Dilute nitric acid precipitates legumin, like the preceding: when concentrated, it dissolves dry legumin with a disengagement of nitrous gas.

Phosphoric acid with three atoms of water also precipitates legumin: an important character, which prevents its being confounded with albumen.

Potassa, soda and ammonia dissolve legumin when cold. With heat, the two first decompose it, disengaging ammonia.

Baryta and lime, in presence of water, likewise decompose it, by aid of a boiling heat. Soluble salts of these bases are formed; ammonia is disengaged. An acid, which will be studied hereafter is, therefore, produced.

Among the substances with which it was curious to act on legumin, was rennet, which, on account of its well known action on caseïn, merited an especial examination.

One hundred cubic centimetres of a concentrated solution of legumin, put in contact with ten or twelve drops of the liquid rennet, sold in Paris for the *Fromageries*, at the end of twenty-four hours had given a complete coagulation of the legumin, which was precipitated at the bottom of the vessel under the form of a gummy mass. During the first hours of contact, the liquors remained limpid, which completely dispelled all idea of any influence whatever on the part of the free acid of rennet.

The precipitation by rennet was perfect, for acetic acid, carefully added to the residue, did not produce the least appearance of turbidness in it.

Finally, the matter coagulated by the rennet consisted of legumin, as is shown by its analysis, which gave the following numbers:—

Carbon	50·41
Hydrogen	6·92
Nitrogen	19·00
Oxygen, &c.	23·67

All the above experiments were performed with the legumin of sweet almonds, which appeared to us to be most easily obtained in the pure state.

They lead us to consider legumin as a distinct body, which is at once characterised by its composition and its properties.

Thus, admitting that legumin contains albumen or caseïn, we regard it as a distinct compound, in which those bodies are united to other combinations.

It would be easy here to present different formulæ which would show the presumable relations between caseïn and legumin; but these are puerile *jeux d'esprit*, so long as experiment does not serve them as a guide and corrective.

The formula which best represents the composition of legumin is the following:—

C^{48}	50·9
H^{37}	6·5
N^{15}	18·5
O^{17}	24·1
	100·0

We are certain that this formula is not definitive; it possesses no interest beyond showing in what respect the composition of legumin differs from that of caseïn and albumen.

We will terminate the history of this body by mentioning a peculiarity worthy of being noted; namely, that the seeds which essentially owe their nutritive to legumin, become aliments of better employment when boiled than when raw. It is therefore the coagulated, and not the soluble legumin which intervenes in digestion.

The experiments of which we have here given an account, establish, in a manner which appears to us certain, that albumen possesses the same composition in all animals, and in all the fluids of the same animal.

Vegetable albumen does not differ in elementary composition from animal albumen, only it is not accompanied by free soda, as is ordinarily the case with animal albumen.

The caseïn taken from herbivorous mammiferous animals is shown to be always endowed with a similar composition, and nearly identical properties. In woman, who from her habits resembles carnivorous mammiferous animals, the milk yields a caseïn which, although presenting a composition similar to that of the caseïn of the herbivora, possesses such properties that it may perhaps one day be necessary to establish a distinction between these bodies.

In bullock's blood, there exists a matter which seems to be confounded with caseïn, as regards both composition and properties.

The farina of cereals, likewise, contains a substance which we are disposed to rank with caseïn, and which possesses, at any rate, its elementary composition and its most essential properties.

Moreover, the caseïn of the milk of the herbivora, that of the milk of woman, the caseïn of blood, and that of farina, possess exactly the same composition as albumen: they certainly are two isomeric substances.

It is not the same with the remarkable and truly distinct substance which enters into the composition of the emulsion of almonds, and which has been noticed by Proust, Boullay, and other chemists, as identical with animal caseïn. This matter contains, without doubt, more nitrogen and less carbon than animal caseïn, and than the true vegetable caseïn—that of the cereals.

It is found, with a similar composition and the same properties, in the ordinary almond, in the kernels of the prune, of the apricot, and probably of the hazel nut; in the seed of white mustard; in beans, peas and lentils.

This remarkable substance resembles gelatin in composition, but differs from it in all respects by its properties: it merits particular attention from its abundance in the alimentary matters which we have just mentioned, and from the incontestable part which it plays in them, and of which it is easy to form an idea by calling to mind that this substance, dissolved in hydrochloric acid, communicates to it exactly the same properties as albumen. So that it may be believed that, under the influence of the gastric juice, this matter furnishes the same soluble products as albumen itself.

Everything tends to show that this matter consists of a mixture or combination of albumen or caseïn with another product; but, as this mixture is made in proportions which seem constant, there can be no objection to preserving to it the name of legumin, which had been proposed by M. Braconnot for designating the matter extracted from beans or peas.

Legumin constitutes, therefore, to the physiologist, a substance analogous to albumen and caseïn, but mixed, or rather combined, with another body containing more nitrogen, which modifies its most important properties.

Doubtless the nutritive power of leguminous plants is in great part determined by the proportion of legumin which they contain; but it would be premature to consider this substance as playing a part exactly similar to that of caseïn or albumen. A portion of the elements of legumin is found in a peculiar and distinct state, which probably renders them less adapted for food than those which are combined in such a way as to produce the exact composition of albumen and caseïn.

The fibrin extracted from the blood of herbivora has always presented to us the same elementary composition. That of man and that of the dog sometimes contain more nitrogen. We found no difference between the fibrin of the calf and that of the ox.

The matter extracted from the gluten of wheat, and which one of us designated by the name of fibrin, possesses a composition resembling the fibrin of herbivora.

All these varieties of fibrin, which differ but little from each other, however, cannot be confounded with albumen or caseïn with regard to elementary composition. They always contain rather less carbon, and much more nitrogen.

A very just idea of the elementary composition of fibrin may even be formed, by regarding it as a compound of caseïn or albumen and ammonia. The following experiment would seem even to confirm this opinion.

When fibrin, which has previously been well washed, is boiled for a long time with water, a liquid containing ammonia distils over. The insoluble fibrin which remains then presents the following composition, which is that of albumen:—

Carbon . . .	53·49
Hydrogen . .	7·09
Nitrogen . . .	15·88
Oxygen, &c. . .	23·54
	100·00

To completely verify this conjecture, we dissolved fibrin of the bull in a cold aqueous solution of potassa, containing five grammes of that substance to a litre of water. The liquor having been precipitated by acetic acid, we obtained a substance which presented to us exactly the composition of the fibrin employed, namely,—

Carbon . . .	53·11
Hydrogen . . .	7·06
Nitrogen . . .	16·78
Oxygen, &c. . .	23·05
	100·00

Hence it follows that fibrin possesses the property of dissolving in potassa without losing its excess of nitrogen, which probably would not happen if this nitrogen were really in the state of ammonia.

M. Bouchardat has ascertained that fibrin and "cupping" of blood, in this prolonged action of boiling water, yield to that liquid a substance resembling gelatin, at least when it has been extracted from "cupping," and which is found by the evaporation of the aqueous solution.

The separation of the fibrin into two products,—the one identical with coagulated albumen, and the other identical with gelatin,—would very naturally explain why fibrin contains more nitrogen and less carbon than albumen, since it is thus with gelatin itself.

But, in considering the whole of our analyses of fibrin, we ascertained that the proportion of gelatin which it was necessary to suppose in it, in order to explain the excess of nitrogen, exceeded all probability. We endeavoured to extract this gelatin, and we never succeeded in preventing the disengagement of ammonia, which always accompanies the ebullition of fibrin. Again, the matter dissolved by water did not present that property of assuming the form of a jelly which constitutes the most essential character of gelatin.

This substance precipitates, it is true, by tannin, like gelatin; but it also precipitates by nitric acid, like albuminous substances.

Finally, its elementary composition does not resemble that of gelatin, as may be seen by the following numbers:—

	II.	III.	B.	C.	D.	Mean.
Carbon . . .	47·68	„	48·15	„	„	47·91
Hydrogen . . .	6·77	„	6·97	„	„	6·87
Nitrogen . . .	„	15·04	„	14·87	15·05	14·96
Oxygen . . .	„	„	„	„	„	30·26
						100·00

This substance, which water dissolves, has, therefore, neither the composition of fibrin, nor that of albumen or caseïn, nor that of gelatin.

It cannot be confounded with fibrin nor with albumen. With regard to caseïn, whose solubility it partakes, it does not present any other of its properties.

Gelatin differs from it completely in its composition; for it contains—

Carbon . . .	50·99
Hydrogen . . .	7·07
Nitrogen . . .	18·72
Oxygen, &c. . .	23·22
	100·00

Besides, gelatin becomes a complete jelly by the cooling of its concentrated solutions; the substance in question does not do so. Gelatin precipitates by tannin, it is true, and so does this substance; but, while gelatin is not precipitated by nitric acid, this matter yields a coagulated, abundant precipitate, when the solution is concentrated. In dilute solutions, nitric acid occasions no precipitate.

Corrosive sublimate likewise precipitates the matter under consideration. Alcohol does not render its solutions turbid, if they are not concentrated.

Moreover, this matter possesses the general character of albuminoïd substances, for it dissolves in hydrochloric acid, and very soon communicates to it a very fine violet blue tint.

It clearly results, therefore, from the whole of the properties of fibrin, that this substance contains a large quantity of a product identical with albumen or caseïn; that it yields this product to the action of dilute hydrochloric acid, and that, consequently, it acts, with regard to gastric juice, quite like caseïn or albumen; and that it also contains a product which is represented by oxidised caseïn or albumen.

Thus, as food, fibrin represents almost its weight of albumen or caseïn; as a product of animal life, it is placed between albumen, from which it proceeds, and the gelatin which is formed at the expense of their nitrogenous aliments.

Independently of these four principal products,—albumen, caseïn, legumin, and fibrin,—there are two other which resemble them in their *modus operandi* with hydrochloric acid, to the point of being confounded with them in the same group, although their properties are entirely distinct: these are glutin and vitellin.

The essential albuminoïd matters, namely, albumen, caseïn, fibrin, and legumin, constitute the predominant nitrogenous element of the nutrition of man and animals. Perhaps they are the only ones which possess at once the property of burning in blood to be converted into urea, and of being fixed in our tissues by the processes of assimilation, after having undergone suitable modifications in their properties. At any rate, it is true that so far it may appear doubtful that gelatin possesses this double property.

Hence it results, that if, in any aliment deprived of gelatin, we arrive at defining the exact proportion of albumen, caseïn, fibrin, and even legumin, we shall have ascertained and estimated the power of this aliment, as capable of satisfying the wants of assimilation. It is by eating and digesting such matters that we form our muscles and tissues, and that we preserve them from the alterations which they would undergo, on the part of blood containing too little albumen or fibrin.

It is so evident that it is thus, that not a single aliment used by man and the superior animals can be mentioned, in which does not exist, as an abundant nitrogenous matter, one of the four above-mentioned substances, namely, caseïn, albumen, fibrin, or legumin. Whence it clearly follows that the quantity of nitrogen which our aliments contain, gives their equivalent with regard to assimilation, the nitrogenous matter being the essentially assimilable matter, that which constitutes the basis of the whole organisation.

It is for this reason that we have wished to define our ideas concerning the composition of these matters, before occupying ourselves more particularly with the discussion relative to their part in elimination.

Knowing, by experiment, that a man, for example, should eat about 100 or 120 grammes of dry albuminoïd matter, representing from 16 to 20 grammes of nitrogen, a table of nutritive equivalents with relation to assimilation may be prepared,—and by this table we shall shortly terminate this part of our work,—according to the method already followed by M. Boussingault, in his Memoirs on the nutritive equivalents of the provenders or aliments of herbivorous animals.

We shall then show, by numerous examples developed in the Memoir, with which M. Boussingault and I (Dumas) are occupied, that in the nutrition of man, considered in the ratio of sustenance, there enters, on the average, 400 or 500 grammes of fresh nitrogenous matter, representing 100 or 125 grammes of the same matter dried, which consequently contains 16 to 21 grammes of nitrogen.

As this nitrogen is found almost entire in the urine, it remains to be asked what urea is, and in what it differs from the neutral nitrogenous matter from which it is derived.

Now the beautiful observations of Wöhler have taught us that urea may be produced by a modification of cyanate of ammonia, itself formed of an oxide of cyanogen and an oxide of ammonium.

Thus are eliminated from the animal four oxides:—Carbonic acid, water, cyanic acid, and oxide of ammonia. The two last, combined and modified, produce urea.

Therefore, at least we admit it, it is by a true combustion that the nitrogenous matter is converted into urea.

When albumen or caseïn is converted into urea, they pass, doubtless, through different intermediate states which, neglected here, give definitively—

$$\begin{array}{llllll}
C^{48}\,H^{37}\,N^{12}\,O^{115}+O^{100}= & C^{6} & H^{12} & N^{12} & O^{6} & \text{urea.}\\
 & C^{42} & & & O^{84} & \text{carbonic acid.}\\
 & & H^{25} & & O^{25} & \text{water.}\\
\hline
 & C^{48} & H^{37} & N^{12} & O^{115} &
\end{array}$$

This formula has no other object than to permit the quantity of heat disengaged during this conversion to be calculated. It shows us, indeed, that the nitrogenous matter every day converted into urea by a man presents about 50 grammes of carbon and 6 grammes of hydrogen as combustible for his respiration.

But these matters can develope only 575,000 unities of heat; in fact,

$$\begin{array}{lllr}
50 \text{ grammes carbon} & \times & 7300 = & 365{\cdot}000\\
6 \quad „ \quad \text{hydrogen} & \times & 35000 = & 210{\cdot}000\\
\hline
 & & & 575{\cdot}000
\end{array}$$

Now, from the quantity of carbonic acid which he furnishes, and from the quantity of oxygen which he consumes, each man must daily produce 2,500,000 or 3,000,000 of *calorics.*

He must, therefore, derive from other aliments about 200 grammes of carbon and 10 grammes of hydrogen, which complete the proportion of heat which he requires.

And this want is so pressing, that after three hours' suspension of the calorific apparatus, death by cold would be inevitable. For, every time a man loses 50,000 *calorics*, his temperature lowers 1 degree, and if he had lost 300,000 *calorics* in 3 hours, or 100,000 per hour, his proper temperature would be reduced to 30 Centigrade degrees, in which case death would be certain.

It is necessary, therefore, that the whole body, all the vessels, all the tissues, all that the blood penetrates,—that this vast apparatus of combustion should act incessantly, and burn without relaxation the organic matters at its disposal.

Now, if we reflect that the blood constitutes a solution of the solid materials of the economy, saturated for the circumstances in which it is placed, we shall comprehend how important it is that digestion should constantly restore to the blood the matters which compose it.

Indeed, since the blood of a man is charged with producing 100,000 *calorics* per hour,—since, for this purpose, it must burn 5 grammes of albuminous matters and 10 grammes of fatty matters, or their equivalent of matters produced from sugar, it is clear that the blood constitutes a saturated solution which, every instant, is inclined to descend below the point of saturation.

Thus, when the blood has lost 5 grammes of albuminous matters and 10 grammes of fatty matters, if these products are not replaced, it is forced to take them again from the very tissue of our organs, which it thus disorders.

It is thus that we explain the theory of nutrition, which is the act of returning to the blood the materials of which it is composed, in order that these materials, which life constantly consumes by burning them, may not again be taken by the impoverished blood, from our organs, which are formed of them, or which contain them.

And to apply these principles to the nitrogenous matters under present consideration, we will say, that if it is indispensable that the alimentation of man daily furnish him with 100 or 120 grammes of dry nitrogenous matters, it is that nothing may prevent the blood of an adult man from losing, daily, 100 or 120 grammes of these matters by respiration, and by the combustion which is the consequence of it.

From the fact alone that the blood contains albumen, it burns it, and it is necessary to return it to it, to prevent it from attacking the sources of life by retaking that albumen in our tissues most indispensable to its exercise.

The Academy will very soon see to what investigations we have devoted ourselves to establish the exact balance between the albuminous, fatty, or saccharine matters consumed, and the proportions of heat produced by their combustion in the body of man or animals: it will see also, and we hope with some interest, the experiments by which we have endeavored to establish on certain bases the rules to be followed in the regimen of the soldier, of the workman and the prisoner, as also the rules which should guide the administrators in establishments devoted to public beneficence.

ON OPIANIC ACID, A NEW ORGANIC BODY DERIVED FROM NARCOTIN.*

BY LIEBIG AND WÖHLER.

This body is especially remarkable from its mode of formation, when narcotin is exposed, under certain circumstances, to oxygenising influences. The best process for obtaining it is as follows:—

Narcotin is dissolved in an appreciable excess of dilute sulphuric acid; finely powdered peroxide of manganese is added to this solution, and it is heated. The liquor soon acquires a saffron yellow color, and disengages carbonic acid gas. The temperature is raised to the boiling point, and maintained until the disengagement of carbonic acid ceases. It must be ascertained that there is, to the last, an excess of peroxide of manganese and sulphuric acid; the liquor is then filtered at the boiling temperature. On cooling, the liquor becomes almost a mass of fine crystallised needles; these are opianic acid. The mass is put on a filter; the yellow liquor passes through; it is washed several times with cold water; finally, the acid is pressed as strongly as possible, and it is purified by being treated with good animal charcoal and by several crystallisations in boiling water.

Opianic acid crystallises in very fine prisms of a silky lustre, of indeterminable form: it is very sparingly soluble in cold water, much more so in hot water, to such an extent that a solution saturated at the boiling temperature almost becomes a complete mass on cooling, like that of benzoïc acid. It is likewise soluble in alcohol; it has an acid reaction, but it has only a faint, slightly acid and bitter taste. It readily melts into a transparent oleaginous liquid, and becomes a crystalline mass on cooling: however, it remains amorphous if heated beyond its melting point. It does not appear to be volatile, although it may be distilled; but this property is due only to its ascent to the sides of the vessel. When heated in the air, it gives out the same aromatic odor as narcotin; like the latter, it is readily inflammable, and burns with a brilliant, fuliginous flame.

Opianic acid expels carbonic acid; it forms soluble salts with all bases: those of lead and silver crystallise in bracteæ and fine brilliant prisms.

It does not contain nitrogen. Liebig and

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* *Gött. Gelehrt Auzeig.*, No. 138.

Wöhler intend to examine its composition, and to give an explanation of its mode of production by narcotin, and of its peculiar action with ammonia.

CHEMICAL COMPOSITION OF THE HUMAN BONES.*

BY DR. FRERICHS.

In the following table, the author has given the proportion of the inorganic to the organic principles, which the examination of a great number of bones, or portions of bones, of the adult, the child and the fœtus, has presented to him. Those of the adult were from one individual. Previous to calcination, all were carefully cleaned, freed from periosteum and medullary fat, and well dried in an oil bath, at from 130° to 140°C.

	Inorganic Principle.	Organic Principle.
Parietal bone of adult	68·5	31·5
„ of a child, aged 3 years	66·3	33·7
Petrous portion of temporal bone of adult	70·2	29·8
Inferior maxillary of adult	68·0	32·0
„ of child, aged 3 years	62·8	37·2
Sternum of adult	64·7	35·3
Rib of adult	65·3	34·7
Humerus of adult	68·3	31·7
Humerus and cubitus of a six months' fœtus	63·2	36·8
Radius of adult	66·3	33·7
„ of a boy, aged 12	65·5	34·5
Tibia of adult	66·2	33·8
Fibula of adult	66·5	33·5
Carious excrescences of another fibula	61·2	38·8
Metatarsal bone of adult	65·9	34·1
Patella of adult	63·7	36·3
Body of lumbar vertebra of adult	60·5	39·5

He draws the following conclusions:—

I. The quantity of calcareous salts varies considerably in the bones of different parts of the same individual.

II. It diminishes in the inverse ratio of the number of the medullary canals and cavities; also spongy bones contain less incombustible substances than compact bones. However, the greater proportion of organic matter cannot be attributed to cartilage, but to a more considerable number of membranes which cover the medullary canals and cavities, and of vessels, from which it is absolutely impossible to free the spongy substance of the bones.

III. The inorganic principles increase with age. However, the table shows that this increase is not so great as Schreyer has supposed.

IV. The quantity of the calcareous salts of the bones is more considerable than that announced by Dr. Rees and several other chemists: these experimentalists, as Berzelius suspected, had incompletely driven off, by desiccation, the water which the bones obstinately retain, and have placed it to the account of the organic matters: thus the quantity of calcareous salts has been estimated too low.

Frerichs' investigations lead him also to think that the carbonate and phosphate of lime are uniformly distributed throughout the substance of the bones; that the intermediate amorphous substance of these organs is formed of a chemical combination of the earthy matter of the bones with the substances which produce gelatin. Afterwards, he resolves the question, as to whether the ratio between the carbonate and phosphate of lime remains the same in spongy and compact bones, by the analysis of the two kinds of bone from the same individual.

Two different spongy bones contained:—

	I.	II.
Organic substance	38·22	37·42
Earthy phosphates	50·24	51·38
Carbonate of lime	11·70	10·89

Two different compact bones contained:—

	I.	II.
Organic substance	31·46	30.94
Earthy phosphates	58·70	59·50
Carbonate of lime	10·08	9·46
	100·24	

ON THE CHEMICAL COMPOSITION OF THE BONES.*

BY R. F. MARCHAND.

The bones, which form the framework to which are suspended the soft parts of the organism, and which includes a portion of them, contain the greatest quantity of solid substances of the animal economy: these substances consist partly of organic, and partly of inorganic, combinations. While the inorganic principles vary according to the different classes of animals, according to age and the state of health, the essential organic principle is invariable; there may be a difference in its quantity, but rarely in its composition. This organic compound, representing the cartilage of the bones, belongs to the class of animal tissues which are converted, by boiling, into gelatin; a circumstance from which they have received the name of *tissues yielding gelatin* (gelatinous tissues). I call the chemical combinations which possess these properties *collagens.*

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* *Annalen der Chemie und Pharmacie;* as given in the *Journal de Pharmacie*, Dec. 1840.

* *Journal für Praktische Chemie.*

The composition of gelatin has been indicated by Mulder, who found it to be formed of—

$C = 50{\cdot}76$
$H = 6{\cdot}64$
$N = 18{\cdot}31$
$O = 24{\cdot}29$
100·00

Mulder deduced for it the formula $C^{13} H^{20} N^4 O^5$, which agrees very well with the results found, and which he also confirmed by the composition of tannate of gelatin. However, it is impossible to make this formula accord with that admitted by Mulder for proteïn, and which is expressed by $C^{40} H^{62} N^{10} O^{12}$.

The following formula, however, perfectly agrees with the numbers found by Mulder:—

$$C^{40} H^{62} N^{12} O^{15}.$$

It contains the formula of proteïn with 2 at. of nitrogen and 3 at. of oxygen, $Pr + N^2 + C^3$; are these two bodies contained in it in the state of combination? This it is impossible to decide. This formula gives—

C^{40}	=	3000·0	50·52
H^{62}	=	387·5	6·52
N^{12}	=	1050·0	17·69
O^{15}	=	1500·0	25·27
		5937·5	100·00

The atomic weight would be about three times that admitted by Mulder (1972). The formula agrees very well with the result of the analysis which this chemist and Schiebel made of the tannates.

Gelatin is altered, as is known, by prolonged boiling, and Mulder found this substance, in this state of alteration, composed according to the formula $C^{23} H^{35} N^7 O^{11}$, which it is impossible to make agree with the primitive formula of gelatin. However, by admitting that the quantity of carbon does not change, the following formula of boiled gelatin may be deduced:—$C^{40} H^{60} N^{12} O^{19}$.

				Found.
C^{40}	=	3000	47·43	47·57
H^{60}	=	376	5·93	5·91
N^{12}	=	1050	16·62	16·76
O^{19}	=	1900	30·02	29·76
		6325	100·00	100·00

The conversion of this substance consists, therefore, in an elimination of water and an absorption of 5 at. of oxygen. $C^{40} H^{62} N^{12} O^{15} - H^2O + O^5$. Science cannot yet account for the conversion of collagen into gelatin. It may be compared with that which starch undergoes when boiled for a long time with dilute sulphuric acid. In neither case is there any disengagement or absorption of gas.

According to the accurate analysis of Chevreul, a weighed quantity of the tissue which contains the collagen, dried at 100°, gives sufficient gelatin to make, with the remaining substance, likewise dried at 100°, the same weight as the matter employed. The principles of collagen have, therefore, neither gained nor lost anything. The change is effected as well in close as in open vessels. The dilute acids, as in the case of starch, accelerate the conversion of collagen into gelatin. The opinion, that the formation of gelatin is due to a transposition of the chemical elements of collagen, is evidently based on the analysis of the tissue which yields gelatin.

I employed with this view the tendon of the foot of a young calf; I freed it as much as possible from fatty matters by means of alcohol and ether, and from other foreign principles by water; its combustion by oxide of copper and oxygen gas gave the following results.

0·528 gr., which left 0·009 gr., or 1·72 per cent. of ash, gave 0·9555 gr. of $C O^2$, and 0·315 gr. Aq., or 50·21 per cent. C. and 6·76 per cent. H.

0·341 gr. at 752^{mm} Bar. and 16° C., gave 59^{cc} of nitrogen, or 18·01 per cent.

0·496 gr. of the tendon of another animal left 0·009 gr. of ash, or 1·82 per cent., 0·915 C. and 0·304 Aq. or 50·30 per cent. C. and 6·82 per cent. H.

The proportion of nitrogen was this time found = 17·84 per cent.

These results agree so completely with the formula $C^{40} H^{62} N^{12} O^{15}$, that it is impossible to perceive any elementary difference between collagen and gelatin.

As to the inorganic constituents of bones, forming the solid substance in the cartilage, which, although not wanting in consistence itself, is, however, soft, especially during life, they are composed of several mineral compounds, the examination of which forms the principal object of this Memoir. It is worthy of remark, that the deposit of these earthy parts is connected with a peculiar chemical transformation of the organic compound. It is known that the cartilage of bones does not form collagen, as Mulder has found, before ossification; it does not yield gelatin by boiling, but a substance resembling it, called chondrin; it is for this reason that I call this cartilage, or the chemical combination which it contains, and which furnish chondrin, *chondrigen.*

Mulder found in chondrin sulphur and a composition differing in general from that of gelatin. He deduced for it the formula $10(C^{32}\,H^{52}\,N^{8}\,O^{14}) + S$. This formula may, however, in my opinion, be replaced by the following, which likewise connects chondrigen with the combinations of proteïn:

$$C^{40}\,H^{62}\,N^{10}\,O^{17} \text{ or } Pr + O^{5}.$$

10 at. of this compound would be united to 1 at. of sulphur.

This combination, which, consequently, represents only one degree of the oxidation of proteïn, is converted by the deposit of the earthy substance of the bones into another combination, collagen, which differs much, in every respect, from chondrigen.

The principal compound of the earthy substance of the bones is phosphate of lime, represented by a peculiar composition, which is also met with among animals, and which is known by the names of apatite and phosphorite. Its composition is $8Ca\,O\;3\,P^{2}\,O^{5}$, which may be decomposed, like certain silicates, into $2Ca\,O\,P^{2}\,O^{5} + 2Ca^{2}\,O^{2}\,P^{2}\,O^{5}$. However, the composition $3Ca\,O\,P^{2}\,O^{5}$ is more accurate.

The bones contain, moreover, carbonate of lime, some salts of other bases, fluoride of calcium, salts whose quantity varies according to the class of animals, and even their age. Some chemists have recently denied the presence of fluoride of calcium: however, the investigations which Erdmann and others made have refuted this objection.

The composition of the human bones was studied, a long time ago, by Berzelius. I have repeated this analysis, selecting a femur, freed from periosteum and fat, of a man aged 30.

I desired to know whether these organs had an essentially uniform composition, and as the two analyses were made in quite different conditions, at different dates, and in different countries, I thought it was the most easy way of resolving the question.

Berzelius found in human bones—

Cartilage completely soluble in water	32·17
Vessels	1·13
Basic phosphate of lime, with a small quantity of fluoride of calcium	53·04
Carbonate of lime	11·30
Phosphate of magnesia	1·16
Soda, with a very small quantity of chloride of sodium	1·20
	100·00

My analysis has given the following results:—

Cartilage insoluble in hydrochloric acid	27·23
„ soluble „	5·02
Vessels	1·01
Basic phosphate of lime	52·26
Fluoride of calcium	1·00
Carbonate of lime	10·21
Phosphate of magnesia	1·05
Soda	0·92
Chloride of sodium	0·25
Oxides of iron and manganese, and loss	1·05
	100·00

If cold hydrochloric acid be poured on bones, the greater portion of the inorganic principles are dissolved, and the animal substances remain. However, it is found that about 5 per cent. of the latter are dissolved at the same time, and accompanies the phosphate of lime. If this salt be precipitated by ammonia, the animal substance is also precipitated, not, it is true, in the state of chemical combination, but in consequence of the attraction of surfaces, which so nearly approaches to chemical combination. The fluor was determined by Wöhler's process.

There is an evident accordance, in this analysis, between the quantity, not only of the organic principles of the bone, but also of its inorganic compounds in particular, and the quantity of the same substances found by Berzelius.

In children, the proportion of the inorganic principles is much less, as is known, although the bones of the trunk appear, according to Dr. Rees's investigations, to make an exception in this respect; however, Dr. R.'s investigations are greatly in want of confirmation, before they can serve as a basis for ulterior conclusions.

The relation which exists in the bones between the carbonate and the phosphate of lime, is worthy of remark, and deserves to be taken into consideration. Fernandez de Barros has made investigations on this subject, which should be extended. From his experiments it results that there exists to 100 parts of phosphate of lime—

	Carbonate of lime.
In the lion . .	2·63
,, sheep . .	24·12
,, fowl . .	11·70
,, frog . .	5·76
,, fish . .	2·52

It appears that the quantity of carbonate of lime is particularly small in the carnivora.

When bones are for a long time exposed to atmospheric influences, they undergo alteration; but it is not very essential. It is not uncommon, especially when they have been some time in the earth, or when they are in the fossil state, to find in them a composition perfectly similar to that of fresh bones.

The influence of interment on the composition of fossil bones is very clearly shown by two comparative analyses which I made of bones of a bear, taken from the pit of Gaileureuth; one was found near the surface, under ground, and the other at a considerable depth. The analysis of the first is designated by I.; that of the second by II.

	I.	II.
Animal substance . .	4·20	16·24
Phosphate of lime . .	62·11	56·01
Carbonate of lime . .	13·24	13·12
Sulphate of lime . . .	12·25	7.14
Fluoride of calcium . .	2·12	1·96
Phosphate of magnesia .	0·50	0·30
Silicic acid	2·12	2·15
Oxides of iron and manganese	2·12	2·00
Soda	1·34	1·08
	100·00	100·00

I also examined the femur of a fossil stag, whose interment I am unacquainted with; however, judging from the small quantity of animal matter that it contained, it was probably not quite excluded from atmospheric influences. The analysis gave—

Animal substance	7·25
Phosphate of lime	54·15
Carbonate of lime	19·26
Sulphate of lime	12·24
Phosphate of magnesia . . .	2·12
Fluoride of calcium	2·08
Oxides of iron and manganese, loss .	2·90
	100·00

We here see that the quantity of carbonate of lime augments with the diminution of the animal substance; the proportion of fluoride of calcium is at the same time very considerable in the three analyses; this fact often occurs in fossil bones, and, indeed, we find in the bones of the stag the quantity of carbonate of lime much greater than in the bones of the bear. Perhaps it is possible to conclude from the more or less considerable proportion of carbonate of lime in the nourishment of the animals themselves, since the herbivora ordinarily contain more of it, and this circumstance might even serve as a guide in the determination of the animals whose bones are discovered. The analysis of the bones of the ox by Berzelius is contradictory of this opinion: these bones contained only 3 per cent. of carbonate of lime, while he found 11 per cent. in human bones.

The cartilaginous substance is not ordinarily completely destroyed by the atmosphere; but it passes to a state of variable conservation in the soil surrounding the bones.

(*To be continued.*)

LAW OF COMPOSITION OF THE PRINCIPAL FATTY ACIDS.*

BY M. DUMAS.

Setting out from margaric acid acid, $C^{68} H^{68} O^4$, so well studied by Chevreul, and subtracting the carbon and hydrogen by equal equivalents, $C^4 H^4$, a series of seventeen acids is formed, of which at least nine are known, which includes the principal fatty acids, and which will connect, by unexpected links, margaric acid with that which seems farthest from it—formic acid.

$C^{68} H^{68} O^4$ margaric acid.
$C^{64} H^{64} O^4$ ethalic acid, from spermaceti.
$C^{60} H^{60} O^4$
$C^{56} H^{56} O^4$ myristic acid, from the nutmeg.
$C^{52} H^{52} O^4$ cocinic acid, from butter of cocoa.
$C^{48} H^{48} O^4$ lauric acid, from laurel berries.
$C^{44} H^{44} O^4$
$C^{40} H^{40} O^4$
$C^{36} H^{35} O^4$ capric acid?
$C^{32} H^{32} O^4$
$C^{28} H^{28} O^4$ œnanthylic acid.

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* *Comptes Rendus*, 2^{me} Semestre, 1842, No. 21.

$C^{24} H^{24} O^{4}$ caproïc acid ?
$C^{20} H^{20} O^{4}$ valerianic acid.
$C^{16} H^{16} O^{4}$ butyric acid ?
$C^{12} H^{12} O^{4}$
$C^{8} H^{8} O^{4}$ acetic acid.
$C^{4} H^{4} O^{4}$ formic acid.

It is very worthy of remark that all the anhydrous acetates possess the pearly appearance which characterises the soaps.

In this series, the acids at the top of the scale are the least fusible, the fusibility regularly increasing to the bottom.

The existence of an acid $C^{72} H^{72} O^{4}$, of which I am almost certain, renders it probable that the scale does not stop at margaric acid.

It is of great interest, not only to complete this series, to compare the physical characters of the bodies which it contains, but also to compare the alcohols, ethers and hydrocarbons which correspond to these different acids, as ethal and ceten correspond to ethalic acid. A profound study of the different fatty matters may lead to this, as I hope very soon to demonstrate.

In all these acids, we find a hydrocarbon isomeric with olefiant gas, which confirms the general relations observed by M. Chevreul, in his truly classical investigations concerning the fatty bodies.

OBJECTIONS TO ROSE'S VIEWS ON THE ACTION OF WATER ON THE SULPHURETS OF THE ALKALINE METALS AND THE HALOID SALTS.

BY REUBEN PHILLIPS.

THE experiments of H. Rose undoubtedly prove that the sulphurets of the earth-producing metals are decomposed by water; but I shall endeavor to show that no fact which he has advanced can warrant the assertion that the sulphurets of the alkali-producing metals are similarly affected, much less that the haloïd salts suffer decomposition by aqueous solution.*

Admitting that the sulphurets of the earth-producing metals form, with water, a variety of products, it cannot therefore be said that the alkaline sulphurets do the same, as the circumstances under which the former reactions are operated essentially differ from those which can possibly take place with the latter; for with the earth-producing sulphurets, the substances formed are partially insoluble in the fluid produced by the decompositions, therefore in this case we have at play the modifying circumstance of insolubility, which will frequently determine actions which may be regarded as counter to affinity; for which reason it is impossible to say that this example renders it at all probable that other sulphurets accomplish with water the same actions when the same powers are not in existence, that is, when all is in solution.

As regards the action of litmus with the sulphuret of potassium, it cannot be admitted that the change of color is any proof that the solution contains an alkali; for example, the following action may take place:—the red coloring matters of the litmus may have an attraction for, and a tendency to produce in the solution, potassa, which attraction may be considered to be much exalted by the powerful affinity of the sulphuret for sulphuretted hydrogen. True, the chlorides, &c. of the same metals do not change the color of litmus; but here, again, the cases are not parallel, as the hydracid is not known to have any affinity for the haloïd salts. As to the development of heat produced by the solution of the sulphuret of potassium, I shall consider it with the heat produced by the combination of the haloïd salts with that substance. I therefore pass on to the fluoride of potassium and water.

Rose states that his experiments positively prove that a solution of the fluoride of potassium does not contain any alkali, but thinks the following instances are opposed to that notion; however, the instances which he has brought forward do not afford a shadow of evidence that such is ever the case. That the double fluoride of potassium and hydrogen may be easily produced, there can be no doubt, and its alkaline reaction with litmus merely shows this; for the same explanation must be applied as that above used for litmus and the sulphuret of potassium. As to its action on glass, it is most probably due to an interchange of elements between the silica and the fluoride of potassium, whereby the double salt of the fluoride of potassium and fluoride of silicon, together with free potassa, are produced. The decomposition of a solution of the fluoride of ammonium by evaporation, into the double fluoride of ammonium and hydrogen, cannot prove that free ammonia exists in the solution previous to evaporation, any more than that free oxide of ethule exists in the bisulphate of that base, because by evaporation nothing but sulphuric acid remains. The case of the fluoride of ammonium, moreover, is not parallel to the fluoride of potassium, as the modifying circumstances—namely, unequal volatility—are not the same. Therefore, none of the examples produced can be admitted as any proof that the fluoride of potassium by aqueous solution is resolved into the double fluoride of potassium and hydrogen, and potassa,—a result which I had previously arrived at by experiment, although not performed with this view.*

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* See "THE CHEMIST," No. I. New Series.

I now pass on to the development of heat by the haloïd salts. It must be allowed that many chlorides are decomposable by water, and that heat is produced during these decompositions; but it does not therefore follow that in all cases in which heat is produced by water and a chloride, similar decompositions are produced. Rose states, in apparent contradiction to what he says a few lines before, that—"Many solid metallic chlorides, which certainly are not capable of decomposing water, often develope much heat by their solution—chloride of calcium, for example." There must here, I think, be some accidental error, as, previously, the production of heat was made the criterion whereby to ascertain whether or not a chloride decomposes water; and in the paragraph above quoted a parallel instance is given, and others alluded to, in which heat is produced by "metallic chlorides certainly not capable of decomposing water;" but without insisting upon this, I will pass on to his explanation as to why the chloride of calcium evolves heat with water: he ascribes it to the chloride of calcium first absorbing water of crystallisation, whereby there is given out its caloric of liquidity; but the resulting solution is fluid; therefore, in the present state of the science, we must consider that if in the first instance water becomes consolidated, and therefore evolves heat, we must also say, that by the conversion of the same solid into a fluid, the same amount of heat would be absorbed as was previously given out; but more than the consolidated water is rendered fluid, inasmuch as the chloride is itself dissolved; therefore the heat required for the conversion of the hydrous chloride into a solution, is = the heat given out by the consolidation of the water + the latent heat absorbed by the anhydrous chloride in its passage to the fluid state. Such is the legitimate deduction from all known facts; therefore the heat developed by the solution of saline bodies must be entirely independent of the consolidation of the water. The heat, then, must be elicited by chemical action, as this is the only cause which can be considered as acting in this case; but does it necessarily follow that water must be decomposed? Is it impossible that a direct combination of the water and the haloïd salt should elicit no heat? That such a combination should evolve heat, is as natural as that heat should be given off during the direct formation of water; but a perfectly parallel development is afforded by effecting the solution of the protoxide of potassium: this oxide, by its union with one equivalent of water, gives an intense heat; if this be ascribed to the consolidation of the water, then, as was previously shown, its subsequent solution should produce cold; but heat is produced; here, then, is an instance of heat afforded by the combination of a compound body in which it is impossible the decomposition of the water can be accomplished.

As to the salts of a certain class of oxides, as those of antimony, bismuth, and mercury, which are, it is true, decomposable by water; but it cannot, therefore, be certainly said that a certain amount of water at first decomposes them into a hydracid and oxide, and that more water displaces the oxide, for as no chemical change is visible until the separation of the oxide is produced, and as no deduction on this point can at present be drawn from the development of heat, we ought according to strict chemical logic to say that no change is produced previous to the separation of the oxide; nay, the very separation of the hydracid from the oxide may be turned into evidence against the doctrine it was intended to support; for the following view may be taken of it;—that in the presence of a certain amount of water the affinity of hydrogen, for the salt radical, and of oxygen, for the metal, being aided by the modifying circumstances of the insolubility of a resulting compound, is greater than the affinity of the hydrogen for the oxygen, and of the salt radical for the metal, therefore an oxide and a salt of hydrogen are produced and maintained, and as their union is impossible they both remain in a free state. This then may be considered as a case of double decomposition.

I shall endeavour to show, that supposing the water to be decomposed, no heat can probably be developed; should the data on which the argument is suspended be admitted, and far more than probable it certainly is, then will it be seen that if the chlorides do decompose water, the action must be accomplished without producing sensible heat. Let it be admitted, that by the combination of metallic equivalent quantities, with like proportional quantities of chlorine, oxygen, &c., the heat is according to one of the three following cases.

Case 1. Any radical evolves the same quantity of heat by its combination with any metal.

Case 2. That the heat differs when different radicals are combined with the same metal; but that the same heat is given with the same radical and any metal, as compared with the same radical and another metal.

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* See "The Chemist," Vol. III. page 332.

Case 3. That the heat differs when different metals are combined with the same radical; but that the same heat is given with the same metal and any radical, as compared with the same metal and another radical.

By either of these, duplex decomposition must be unattended with heat. To make it more tangible, suppose iodide of sodium and chloride of potassium to exchange elements; then, by Case 1, the quantity of heat contained by either chloride of potassium, chloride of sodium, iodide of potassium, or iodide of sodium, is equal to that contained by either of the others, therefore no heat can be liberated by the decomposition.

By Case 2, chloride of potassium contains either more or less heat than the iodide of potassium, and in the same ratio the chloride of sodium is greater or less than the iodide of sodium, and $K\,Cl = Na\,Cl$, and $K\,I = Na\,I$; therefore $K\,Cl : Na\,I :: Na\,Cl : K\,I$, and both sides of the proportion are equal; from which it is evident that no heat can be liberated in this case.

By Case 3, chloride of potassium contains either more or less heat than the chloride of sodium, and $K\,Cl = K\,I$, $Na\,Cl = Na\,I$; therefore $K\,Cl : Na\,I :: Na\,Cl : K\,I$, and both sides of this proportion are also equal.

Hydrogen may safely be considered as acting the part of a metal in its combinations with the more electro-negative radicals, without going to the extent of Dumas' views on the subject.

But duplex decomposition does apparently produce heat; all I wish at present to maintain is, that if Case 1, 2, or 3, be correct, no duplex decomposition can produce heat; finally, I will observe, that if Case 1 can be shown to be correct, then no instance of simple elective affinity can produce heat, and the heat which frequently appears to attend this and the former instance must be ascribed to other causes.

ON IODIC ACID.*

BY M. POULENC.

Iodic acid and its preparation have often been spoken of; many processes have been published, by which, as their authors say, it is easily produced; but all of them often present the greatest difficulties and a very scanty and expensive product. Serullas has left us at least three processes which would be too expensive, if it were required to obtain this acid in large quantity. I have several times tried the process of M. Boutin, which consists in the simultaneous employment of nitric and hyponitric acid, and I am sorry to say the results were not very satisfactory. M. Bourson has recently published a note on the same subject;* and, I know not whether owing to want of detail or clearness in his process, I am told by a manufacturing chemist, who repeated the experiment with the most concentrated nitric acid of commerce, this young chemist not having indicated any particular mode by which it could be obtained more concentrated, the trial was fruitless.

My process, which I am about to describe, and which I discovered four years ago, if it has not the merit of being entirely new, will have that of being more according to facts; and I think I may assert, that whoever carefully repeats my experiments, will easily succeed.

It is also with nitric acid that I obtain iodic acid. I prepare it as follows:—

I take equal parts of fused nitrate of potassa, and sulphuric acid as free from water as possible. The acid which I employed for my experiments had been concentrated by several hours' boiling. After having poured the acid on the powdered salt in a glass retort, I adapt to the neck of the retort a tubulated phial dipping into a frigorific mixture, with the view of condensing, as much as possible, the vapors of hyponitric acid; I likewise adapt a long tube right to the tubulure of the phial. The operation should be conducted with moderation and with care. The nitric acid is excessively red, and holds in solution a very considerable quantity of hyponitric acid. 3500 of sulphuric acid and an equal quantity of fused nitrate of potassa yielded a product of 2000 grammes of nitric acid which marked from 45 to 48 of Baumé's areometer. This quantity of nitric acid was sufficient to decompose more than 200 grammes of iodine, and I obtained about 375 grammes of iodic acid in a few hours. I have employed iodine in two different states:—1st, iodine precipitated by means of chlorine, which I had several times strongly compressed in unsized paper, and afterwards divided by trituration; 2nd, sublimed iodine, powdered as finely as possible; in either case, I obtained satisfactory results. I think the preference should be given to precipitated iodine, but on condition that is very dry.

To obtain iodic acid, it is sufficient to place in a bottle with a long neck 25 grammes of iodine, and to add at first 80 grammes of red nitric acid; heat very gently on incandescent coals, or, which is still better, on the sand-bath; the reaction is prompt and rapid. If the iodine is not entirely decomposed, which almost always happens, I decant the acid which has no more action, and replace it by an equal quantity of fresh acid. Some iodine always remains unattacked. After a series of similar operations, I dry the whole on a sand-bath in a porcelain capsule, to drive off the excess of iodine; I redissolve in distilled water, and crystallise it, either by adding a small quantity of nitric acid at 40°, as M. Boutin advises, or, as Serullas did, by leaving it in the syrupy state, in contact with the air, to spontaneous evaporation. The first of these means is the most expeditious; the second gives the best crystals. If, after having added the nitric acid, it be stirred until dry, the acid is sandy, crystalline and very white.

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* *Journal de Pharmacie*, Dec. 1842.

* *See* THE CHEMIST, Vol. III. p. 43.

ON THE CONSTITUTION OF HYPOPHOSPHOROUS ACID.*

BY A. WURTZ.

Hypophosphorous acid was discovered by Dulong and afterwards very carefully studied by H. Rose. The data of these chemists do not agree in all points. Dulong found in this acid 72·75 of phosphorus and 27·23 of oxygen per cent., and from this deduced the formula $P^4\,O^3$. Rose, on the contrary, found 79·69 of phosphorus and 20·31 of oxygen. These numbers exactly lead to the formula $P^2\,O$. These differences in the results of these two chemists, and the circumstance that the water of the hypophosphites has never been determined with precision, induced the author to repeat the analyses of some of these salts. We will here content ourselves with giving, with his refutation of Rose's opinion relative to the constitution of this acid, the conclusions to which his own results have led him.

Rose states that hypophosphorous acid may be regarded as a combination of phosphoric acid and phosphuretted hydrogen. This opinion is especially supported by the mode of decomposition which the acid and its salts undergo by heat. Phosphuretted hydrogen has, moreover, a composition analogous to that of ammonia, with which it also presents another point of resemblance, in forming peculiar combinations with hydriodic acid and certain chlorides. Therefore, without injuring the analogies, the part of a base might be attributed to it. According to this opinion, the following would be the general formula for the hypophosphites:—

$$P^2\,O^5\left\{\begin{array}{l}P^2\,H^6+H^2\,O^2=P^4\,O^2+2R\,O+4H^2\,O\\ R\,O\\ R\,O\end{array}\right.$$

And the analogy of phosphuretted hydrogen to ammonia would be again confirmed in this sense, that one atom of water would be necessary for the constitution of the salts which both bases form with the acids. There would be, however, this grand difference—that phosphuretted hydrogen cannot, like ammonia, be replaced and eliminated by another base. In this respect, hypophosphoric acid should be ranked with ethero-phosphoric acid.

However plausible this theory may at first sight appear, Wurtz thinks that it falls to the ground before facts.

I. According to this theory, the hypophosphites would be nothing more than ordinary phosphates in which one equivalent of oxide is replaced by phosphuretted hydrogen; we should therefore be able to replace a second equivalent by water or by another oxide; in a word, this theory permits us to infer the existence of two series of salts; the one, of double salts, according to the formula—

$$P^2\,O^5\left\{\begin{array}{l}P^2\,H^6,\ H^2\,O\\ R\,O\\ M\,O;\end{array}\right.$$

the other of acid salts, according to the formula—

$$P^2\,O^5\left\{\begin{array}{l}P^2\,H^6,\ H^2\,O\\ R\,O\\ H^2\,O\end{array}\right.$$

However, there exists neither the acid barytic salt, which characterises the polybasic acids, nor a salt which contains, for one equivalent of potassa, an equivalent of soda.

II. If phosphuretted hydrogen existed quite formed in hypophosphorous acid, this acid, put in contact with salts of copper, should give the characteristic reaction of phosphuretted hydrogen; phosphuret of copper should be formed: but all these salts are simply brought to the state of metallic copper, and pure hydrogen gas is disengaged. It is perfectly impossible to give a satisfactory explanation of this phenomenon, admitting the theory in dispute.

III. The same difficulty is presented in the explanation of the fact mentioned by Rose, namely, that pure hydrogen is always disengaged when a hypophosphite is heated with an excess of potassa.

IV. If hypophosphorous acid contains phosphuretted hydrogen quite formed, how should its conversion into phosphorous acid by the oxygen of the air or of peroxide of lead be explained?

Wurtz concludes from the foregoing, that this hypothesis relative to the constitution of hypophosphorous acid presents such great difficulties, that it seems impossible to admit it. He had undertaken his work in the hope of confirming this theory, but observation contradicted it, and he was thus led to another opinion, which appears to him to be more in accordance with the phenomena presented by hypophosphorous acid.

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* *Annalen der Chemie und Pharmacie;* as given in the *Journal de Pharmacie*, Dec. 1842.

According to him, this acid may be considered as the oxide of a compound radical, according to the formula—

$$(P^2\,H^4)\,O^3 = P^2\,O + H^4\,O^2.$$

If the two equivalents of hydrogen be imaginarily eliminated, we have phosphorous acid, but if they be replaced by oxygen, phosphoric acid would be obtained.

Let us see if this theory agrees with the results of observation.

And at first, hypophosphorous acid, regarded in this manner, is unibasic, which sufficiently explains the neutrality of its salts and the impossibility of obtaining an acid salt of baryta, and a double salt with potassa and soda.

The composition of the salts is, then, expressed by the following formulæ:—

Salt of baryta with water of crystallisation (crystallised in needles)—

$$P^2\,H^4\,O^3 + Ba\,O + H^2\,O.$$

Anhydrous salt of baryta (crystallised in square tables)—

$$P^2\,H^4\,O^8 + Ba\,O.$$

The formulæ of the salts of lime and lead are analogous to the last. These two salts are certainly anhydrous.

From the formula $P^2\,H^4\,O^3$, may with facility be deduced all the products of the decomposition of the hypophosphites by heat.

$$\begin{array}{lll} P^2 & & O^5 \\ P^3 & & O \\ P & H^3 & \\ & H^6 & O^3 \\ & H^3 & \\ \hline \end{array}$$
$$P^6\,H^{12}\,O^9 = 3P^2\,H^4\,\dot{O}^3$$

This formula explains the conversion of the hypophosphites into phosphites by the absorption of oxygen.

$$P^2\,O^3\,H^4 + O^2 = P^2\,O^3 + H^4\,O^2.$$

It gives also a very satisfactory explanation of the action of potassa on these salts: the two equivalents of hydrogen become free, and phosphorous acid remains, which absorbs more base than hypophosphorous acid.

$$P^2\,H^4\,O^3 = P^2\,O^3 + H^4.$$

The reduction of the salts of copper is explained with the same facility: the hydrogen becomes free, and the phosphorous acid in the nascent state reduces the oxide.

$$\begin{array}{r} P^2\,H^4\,O^3 \\ 2Cu\,O \end{array} \left\{ \begin{array}{l} P^2\,O^5 \\ \;2Cu \\ H^4 \end{array} \right.$$

Peroxide of lead yields half of its oxygen to hypophosphorous acid: the oxide then combines with the phosphorous acid formed:—

$$\begin{array}{ll} 2Pb\,O & H^4\,O^2 \\ P^2\,H^4\,O^3 & P^2\,O^5 + 2\,Pb\,O. \end{array}$$

It is evident, says the author, that all the phenomena which hypophosphorous acid presents to us, find an extremely simple and satisfactory explanation by the above mode of expressing the constitution of this acid,

Professor Liebig, he adds in conclusion, in his Memoir on the constitution of the organic acids, has demonstrated that the acids in general may be considered as hydracids. If this theory be applied to hypophosphorous acid and its salts, the following formulæ are obtained.

Acid.

$$P^2\,H^4\,O^4 + H^2.$$

Salts (anhydrous).

$$P^2\,H^4\,O^4 + R.$$

ON SOME COMPOUNDS OF PHOSPHORUS WITH THE HALOGEN BODIES.*

BY M. CAUVY.

A CRYSTALLISED and well-defined compound of iodine and phosphorus is obtained, by dissolving in protochloride of phosphorus a certain quantity of these two bodies; the compound is presented in fine needles of a bright red, and is very easily obtained.

Its composition, as given by analysis, is:—

Phosphorus . . .	0·142
Iodine	0·858
	1·000

which corresponds to the formula $P^4\,I^6$, and would give a compound, analogous to hypophosphorous acid, taking for the formula of the latter $P^4\,O^3$, adopted by Thénard.

This iodide fuses between 120° and 130° C.; at a higher temperature it is altered; water decomposes it, giving a precipitate of phosphorus; it is the same with damp air, which converts it into hydriodic acid, and various acids of phosphorus; dry air has no action on it; nitric acid rapidly destroys it; on this action is based the process by which it is analysed.

By an analogous process, a compound with bromine, already known, was obtained, but which it was difficult to procure in very considerable quantity: it is the perbromide of phosphorus; it crystallises in fine needles of a lively red, analogous to those of the hypo-iodide above described.

The halogen bodies form, with phosphorus, a series of combinations in very small ponderal proportions, which have attracted my attention, on account of the distance which separates them from known defined bodies; these are compounds which contain only a few hundredths of halogen bodies and much phosphorus.

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* *Comptes Rendus*, No. 26, Dec. 26, 1842.

Chloruretted phosphorus is abundantly produced in a great number of reactions, and especially in the various processes by which the different chlorides of phosphorus are obtained; it is of an orange yellow color, solid and very volatile.

Ioduretted phosphorus is readily obtained by fusing together suitable quantities of phosphorus and iodine, and freeing the compound from the excess of these two bodies, either by sublimation or by numerous washings in boiling water. Thus is obtained a pulverulent residue of a brick-red, infusible, unalterable by air or water, which volatilises only at a temperature nearly sufficient to soften glass, which is instantly decomposed by nitric acid into iodine and phosphoric acid, and which, like phosphorus, possesses the property of burning in contact with the air at a sufficient temperature. It contains a very uniform proportion of phosphorus, which, from analysis, amounts to 0·895 of the total weight.

This body mixes, in all proportions, with phosphorus. The great tendency which iodine has to produce this red compound may be turned to account as a very sensible test for detecting small quantities of iodine in solutions containing chlorine or bromine. By heating in a tube a fragment of phosphorus with the liquid to be tested, to which a small quantity of nitric acid is added, the phosphorus is very soon seen to acquire a reddish yellow color, if the liquid contains iodine; chlorine and bromine, in the same circumstances, do not produce any similar effect.

INVESTIGATIONS CONCERNING THE METALLIC ACIDS.*

BY M. FREMY.

(MEMOIR III.)†

In the first Memoir which I had the honor of presenting to the Academy, I described a new compound of iron with oxygen, which I called *ferric acid.* The second Memoir was devoted to the study of stannic acid. That which I now present makes known some new properties of the oxides of aluminum, zinc, lead, tin, and bismuth. I think I have demonstrated in my investigations concerning stannic acid, that a metallic acid acquires electro-negative properties only when combined with water, that it loses them when it becomes anhydrous, and that its capacity of saturation increases with the proportions of water which it contains: this principle is confirmed by the experiments which I now communicate to the Academy.

All chemists know that alumine readily dissolves in potassa and soda; but a definite combination of alumina with an alkali has not yet been analysed. The analysis of such a combination appeared to me important; it has shown that alumina, in certain cases, acts like an acid. It is already known that alumina is found, in certain minerals, in the state of aluminate. I prepared perfectly crystallised aluminate of potassa; I found that it was composed of one equivalent of alumina and one equivalent of potassa. This salt is hydrated, and contains 2 eqs. of water; thus, in the neutral aluminates, the relation between the oxygen of the acid and that of the base, is as 3 to 1.

The examination of the combinations of oxide of zinc with the alkalis presents great difficulties. These compounds are in general deliquescent and do not crystallise. I have, however, arrived at preparing a crystallised zincate of potassa, by treating a solution of oxide of zinc in potassa with a small quantity of alcohol; thus is obtained, a salt crystallised in long needles, which I consider to be a bizincate of potassa. This salt is immediately decomposed by water into anhydrous oxide of zinc, and into potassa, which remains in solution.

The action which the alkalis exert on protoxide of tin presents very curious peculiarities. According to some chemists, protoxide of tin in solution in an alkali should deposit, on the liquid being evaporated, crystals of metallic tin; according to others, this solution should give crystals of anhydrous protoxide of tin. The experiments which I have made on this subject have demonstrated that when protoxide of tin is dissolved in a small quantity of alkali, and when the liquor is concentrated under the receiver of a pneumatic machine, there arrives a moment at which the alkali deprives the protoxide of tin of its water of hydratation; the oxide of tin loses its solubility in the alkali, and is precipitated in the anhydrous state. When, on the contrary, the hydrated oxide of tin is dissolved in an excess of alkali, and when the liquor is rapidly evaporated, the protoxide of tin is decomposed into stannic acid, which remains combined with the alkali, and tin which is precipitated. It is evident, therefore, that it is the excess of alkali which causes the decomposition to vary. The preceding observations show that potassa in solution may act on the water of hydratation

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[*] *Comptes Rendus*, No. 24, Dec. 12, 1842.

[†] For Memoirs I. and II., *see* "THE CHEMIST," VOL. III. page 134.

of an oxide, and pass it to the anhydrous state. This experiment induced me to study the influence of other bodies in solution on hydrated protoxide of tin; and it was this examination that led me to the discovery of certain isomeric states of protoxide of tin. When hydrated protoxide of tin is boiled with a quantity of potassa insufficient for dissolving it, there arrives a time when the precipitate, which has no appearance of crystallisation, is suddenly converted into an infinity of very hard, brilliant and perfectly black crystals. This body is anhydrous protoxide of tin.

This oxide differs, in color and crystallisation, from oxide of tin prepared by the very curious process given by Gay-Lussac, which consists in boiling protochloride of tin with an excess of ammonia; but these two oxides may easily be brought to the same state; for, if black oxide of tin prepared by potassa be heated in a tube to a temperature of about 200° C., it undergoes a kind of decrepitation, the crystals violently separate, increase in volume, change in form, and are metamorphosed into the olive oxide, in all respects similar to the oxide prepared by Gay-Lussac's method. Salts in solution also have the property of rapidly dishydrating protoxide of tin. If hydrated protoxide of tin be boiled for a few seconds in concentrated solutions of chloride of potassium, or sal ammoniae, the oxide is soon dishydrated. If a small quantity of hydrated protoxide of tin held in suspension in a very weak solution of sal ammoniac be evaporated, at the moment when the salt precipitates from its solution, the hydrate is converted into a powder of a very fine vermilion red. This body is also protoxide of tin in a new isomeric state. It may very easily be transformed into the olive oxide by mechanical agency; for, when it is made to undergo friction with a hard body, it immediately assumes the brown color which characterises anhydrous oxide of tin. Thus, then, by the processes which I have just described, I have obtained protoxide of tin in three different physical states: in the states of black, olive, and red.

Protoxide of tin is not the only oxide which has the property of being dishydrated by the action of the alkalis. When hydrated oxide of bismuth is boiled with an alkaline solution, a period arrives when the precipitate, which, at first, was white, is converted into a considerable quantity of small yellow brilliant needles, which are anhydrous oxide of bismuth.

The action which the alkalis exert on oxide of bismuth at an elevated temperature, permitted me to isolate peroxide of bismuth in a state of absolute purity. It is known that this oxide had been pointed out by different chemists, but hitherto it has not been obtained in the pure state. M. Jacquelain has proved that oxide of bismuth, heated in a silver crucible with an alkali, becomes the peroxide and combines with an alkali: but he could not obtain the peroxide of bismuth in the solid state.

I have ascertained that when oxide of bismuth is heated with soda, it absorbs oxygen and is converted into bismuthate of soda; and if this salt be boiled with an excess of soda, the metallic oxide is dishydrated, and then abandons the alkali, as in the experiments described above. This oxide, thus obtained, is of a puce color, like the peroxide of lead, and may be washed with concentrated nitric acid without being decomposed. This oxide, when analysed, was found to have the composition of $Bi^2 O^4$. Thus, then, the two oxides of bismuth evidently have for formulæ $Bi^2 O^3$ and $Bi^2 O^4$. This result is in perfect accordance with the experiments of Jacquelain, and Regnault's recent investigations concerning the specific heat of bismuth and its combinations.

Finally, it remains for me to speak of the oxides of lead.

The protoxide of lead dissolves in the alkalis and forms crystallised compounds with some bases, but the hydrated protoxide of lead is dishydrated, under the influence of the alkalis, with as much facility as the oxides of tin and bismuth. It is thus that, when hydrated protoxide of lead is boiled with a quantity of alkali insufficient for dissolving it, the hydrate is converted into anhydrous and perfectly crystallised oxide of lead.

It was this oxide that Payen obtained by treating acetate of lead with ammonia. This oxide may, as Payen remarked, change color when raised to a high temperature; friction may also operate this transformation.

The solutions of protoxide of lead in the alkalis deposit, by evaporation, crystals of anhydrous oxide of lead, which differ from the preceding in the facility with which they dissolve in even dilute alkaline solutions.

The observations which I have made relative to the protoxide of lead demonstrate, therefore, that this oxide combines with bases when it is hydrated, but that, like protoxide of tin, it is dishydrated under the very influence of the alkalis which hold it in solution, and that it is then precipitated in the crystalline and anhydrous state, presenting different properties according to the circumstances which have determined its precipitation.

There exists a peroxide of lead, which is often called the *puce oxide*, which hitherto possessed indifferent properties; until now, it was thought that this oxide could contract no other combination. All chemists, however, regarded minium as a combination of peroxide of lead with the protoxide. This fact induced me to ascertain whether the peroxide of lead could not be united to other bases.

Now, from experiments which I have made on this subject, it results that the peroxide of lead is a true acid, which can combine with all bases to form well-defined and often crystallised salts, whose general formula is $Pb\,O^2, M\,O$.

I therefore propose to give to the second combination of lead with oxygen the name of *plumbic acid*, reserving the name of *plumbites* for the salts formed by the action of protoxide of lead with the metallic oxides, to distinguish them from the *plumbates* which result from the combination of peroxide of lead with bases.

All the plumbates are prepared by the dry way. The plumbates of potassa and soda are obtained by heating, in a silver crucible, peroxide of lead (*plumbic acid*) with an excess of those alkalis. The mass is treated by water; the liquor abandons by evaporation perfectly defined crystals of alkaline plumbate. These crystals may also be obtained by heating in the air protoxide of lead with alkali which is peroxidised and which oxygenises the protoxide of lead.

The plumbates of potassa and soda crystallise perfectly in alkaline water, but are decomposed by pure water. Consequently, when a solution of plumbate is diluted with a large quantity of water, it soon acquires a deep red color, and deposits plumbic acid. The acids form in the plumbates a precipitate of plumbic acid.

All the plumbates are obtained by calcining in the air a mixture of metallic oxide and protoxide of lead. Thus, then, minium is one of the salts of the series of the plumbates; it is a plumbate of protoxide of lead, which is prepared by the general method which I have just indicated. It is known that when a metal is capable of forming both an oxide and an acid, there generally exists a combination of the acid with the oxide: we may here mention, as examples, the chromate of chrome, the tungstate of tungsten, the stannate of tin, &c. &c. Minium, therefore, ranks in this series of bodies.

Such is the summary of the experiments which compose my third memoir on the metallic acids; they demonstrate:—

1st. That the protoxides of tin and lead owe their solubility in the alkalis only to water of hydratation: that they may lose it under feeble influences, and that the oxides are then precipitated in the anhydrous state and with properties which depend on the circumstances which have determined the precipitation.

2nd. That bismuth may form a peroxide whose formula is $Bi^2\,O^4$, which may be obtained in the isolated state, which confirms the atomic weight and the specific heat of bismuth and its compounds.

3rd. That the second combination of lead with oxygen, which had hitherto been regarded as an indifferent body, is a true acid which forms, with bases, crystallised salts.

The new facts which I have so far observed relative to the metallic oxides, have determined me to investigate all the combinations of the metals with oxygen: I shall have the honor of communicating to the Academy the results which appear to me to be worthy of its attention.

ON THE COMPOSITION OF JAPAN WAX, WITH SOME REMARKS ON ITS DISTILLATION, AND ITS OXIDATION BY NITRIC ACID.*

BY B. STHAMER.

There still prevails much uncertainty relative to the origin of Japan wax; but it appears, at all events, that commerce presents under this name different kinds of wax, as is shown by the difference in the point of fusion and in the composition of those which have been hitherto examined. This wax was first analysed by Oppermann, then by Brandes, and has lately been studied, *de novo*, by Sthamer, at the invitation of Professor Liebig.

That which he employed in his investigations was formed of very large, round disks, about 0·027 in thickness, convex on one side and presenting small furrows, tarnishing slightly by long exposure to the air. It was of a rather softer consistence and more brittle than bleached bees' wax, which it greatly resembled, however, in its external characters; it was also more greasy to the touch, and had a peculiar odor resembling that of suet. It was supple and flexible between the fingers, and was reduced to powder by mastication. It readily and completely dissolved in hot absolute alcohol; the solution assumed the form of a jelly on cooling; it was, on the contrary, almost insoluble in cold alcohol. Hot ether dissolved it more readily than alcohol, and the greater part separated from it in flocks by cooling. It melted at 42° C., and solidified at 40° C.

After having successively converted the soap of potassa—obtained by fusing this wax with half its weight of hydrate of potassa—into the soap of soda, and this again into the soap of lime, the latter, held in suspension in water, was decomposed by hydrochloric acid: the acid, which was then separated, showed no traces of oleïc acid; the latter acid does not exist, therefore, in Japan wax, and its absence has also been confirmed by the results of its dry distillation and of its oxidation.

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* *Annalen der Chemie und Pharmacie.*

The acid extracted from the calcareous soap was purified by several crystallisations in alcohol, and by a final one in a mixture of ether and alcohol; then washed with cold alcohol, and dried between folds of blotting paper. It was then perfectly white; it readily dissolved in hot alcohol of 0·84, and crystallised from it in beautiful needles in the form of tufts. Its melting point is constant at 60—61° C. When melted, it presents, on cooling, an aspect similar to that of wax, and is completely volatilised by heat.

This acid thus obtained is hydrated: the anhydrous acid has, according to the analysis of its salt of silver, the following composition:—

		Calculated in 100 parts.
32 at. Carbon* . . .	2427·328	77·94
62 „ Hydrogen . . .	386·864	12·42
3 „ Oxygen	300·000	9·64
	3114·192	100·00

The composition of the hydrated acid is—

		Calculated.	Found.
32 at. Carbon	2427·328	75·23	75·08
64 „ Hydrogen . . .	399·344	12·38	12·54
4 „ Oxygen . . .	400·000	12·39	12·38
	3226·672	100·00	100·00

It contains, therefore, in the hydrated state, 1 atom of water, which is, in the salts, replaced by an equivalent of base.

Thus this acid has a composition entirely identical with that of ethalic acid, first described by Dumas and Stass, and with that of palmitic acid discovered by Frémy and Dr. Stenhouse in palm oil: it most resembles the latter in its melting point, since ethalic acid melts at 55·5° C., while palmitic acid melts only at 60° C. It would be, then, palmitic acid, or rather the modification, which is obtained by heating the latter to 300° C., because its crystallisation resembles it more. Its transformation into this modification is also with facility, and quite naturally, explained by the strong heat which it has undergone during saponification.

To ascertain what base this acid is combined with in Japan wax, one part of the latter was submitted to dry distillation; acroleïn was then very abundantly developed, and this fact demonstrated the presence of oxide of glycerule in the wax: it was likewise confirmed by the saponification of a portion of this wax by means of the subacetate of lead, which furnished glycerine.

Japan wax should consequently be regarded as a true fatty substance—that is to say, as a combination of a fatty acid with oxide of glycerule, like palmitate of oxide of glycerule. If at the same time the formula admitted by Lecanu, in his investigations, be established, namely, half an atom of anhydrous glycerine minus one atom of water,

$$\frac{C^6 H^{14} O^5 - H^2 O}{2} = C^3 H^6 O^2,$$

the following formula is arrived at, which agrees with the analysis of the wax:—

1 at. Palmitic acid	$= C^{32} H^{62} O^3$	3114·192
1 „ Glycerine	$= C^3 H^6 O^2$	465·000
1 „ Japan wax	$= C^{35} H^{68} O^5$	3579·192

The wax crystallised in ether is composed of:—

		Calculated.	Found.
35 at. Carbon . . .	2654·890	74·18	74·11
68 „ Hydrogen . . .	424·302	11·85	11·77
5 „ Oxygen . . .	500·000	13·97	14·12
	3579·192	100·00	100·00

DISTILLATION OF JAPAN WAX.

Japan wax gave, by dry distillation, a large quantity of acroleïn and an acid which analysis has shown to be the same as that obtained by its saponification, palmitic acid. It left in the retort, after the distillation, a black and spongy carbonaceous residue. It did not yield sebacic acid, an additional proof of the absence of oleïc acid.

OXIDATION BY NITRIC ACID.

Pure nitric acid was poured on a portion of this wax, and the digestion was maintained for several days in a sand-bath. After a few days the wax was changed in its nature; it did not solidify by cooling, but floated on the nitric acid, under the form of a yellowish, oily liquid. The mixture was afterwards put into a retort fitted with a receiver, and heated for several weeks at a gentle heat, in a sand-bath, always cohobating the distilled nitric acid and frequently adding fresh strong acid. There was then disengaged a continual current of deutoxide of nitrogen, especially when the contents of the retort had been a little concentrated; however, no formation of any other volatile product could be observed. The distillation was then interrupted at the end of a few weeks, and white crystalline crusts were deposited by the cooling of the concentrated liquor.

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* The atomic weight = 75·851.

These last were washed on a filter with concentrated nitric acid, purified by two crystallisations in nitric acid, three others in water, and then dried. They were under the form of beautiful tabular crystals, perfectly white and transparent, which readily dissolved in warm water, and which, heated in a small matrass, completely sublimed in white needles with a silky lustre.

These crystals, perfectly dried at 100° C., presented the following composition:—

		In 100 parts.
4 Carbon . .	305·74	41·10
6 Hydrogen .	37·44	4·98
4 Oxygen . .	400·00	53·92
	743·18	100·00

The anhydrous acid is formed of—

		In 100 parts.
4 Carbon . .	305·74	48·48
4 Hydrogen .	24·96	3·96
3 Oxygen . .	300·00	47·56
	630·70	100·00

The formula of this acid is, therefore, identical with that which Berzelius has adopted for succinic acid: $C^4 H^4 O^3 + Aq.$ Dr. Sthamer does not hesitate to consider it as such, particularly as the reactions of the two acids are the same.

OBSERVATIONS ON ELECTRICAL AND CHEMICAL AFFINITY.*

BY HORATIO PRATER, ESQ., MEM. ELEC. SOC.

(*Abstract.*)

UNTIL it has been shown, by *many* satisfactory experiments, that all substances, in their natural state insoluble in menstrua, may by electrical agency be made to dissolve therein, (as gold, for instance, in sulphuric acid, &c. &c., as explained in my former remarks,) I must continue to hold the opinion, that electricity and chemical affinity or attraction have not yet been *proved* to be identical forces: I do not mean to say I have proved them not to be identical: I have only, by these and former published observations, rendered such opinions as I conceive *far more probable* than the opposite. In my printed remarks on the present subject, I have admitted that affinity is powerfully *influenced* by electricity,—that it may be diminished, increased, and perhaps sometimes taken away; but as I do not even now find, by the experiments of others, or by my own, that it is *given*, in the strict sense of the word, I cannot yet consider electricity and affinity identical.* I have, as I have said, admitted that electricity *increases* apparently, in some cases, solubility, (as it may the solution of gold in both cases above referred to,) just as heat does; but this is a very different thing from *giving* it. Even this increase of solubility is not commonly, though sometimes, from increase of affinity, (*i. e.* hastened affinity); but solely because of a property of electricity to decompose some compounds and *set free the acid.*

DEVELOPMENT OF ACARI GALVANICI IN FERROCYANURET OF POTASH.†

BY W. H. WEEKES, ESQ., M.E.S., &c.

IN one of my experimental arrangements, commenced early in May last, a voltaïc current from a sulphate of copper battery has been constantly traversing two separate solutions of *ferrocyanide of potash*, contained in peculiar forms of apparatus, a description of which, with other details, I hope eventually to have the honor of submitting to the Society. A swarm of acari have just made their appearance from this highly poisonous preparation; and the main object of my communication at this moment is to request that you will do me the favor to present to the Society the accompanying glass tube, charged with spirit of wine, in which are floating fifteen specimens procured from the source alluded to; these being a few of the first acari ever developed from this remarkable electrolyte.

Sandwich, 26*th Oct.* 1842.

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* *Proceedings of the London Electrical Society*, Part VII.

* I have used the term Chemical Affinity, because in use, but Chemical Attraction is the more correct. So that we understand one another, the terms used matter little.

† *Proceedings of the London Electrical Society*, Part VII.

LONDON ELECTRICAL SOCIETY.

TUESDAY, Jan. 17.—AMONG the papers read at this meeting was one by **MARTYN ROBERTS**, F.R.S.E., &c., "On Assaying by Galvanism;" being a process practised and perfected by him many years ago, as superior to the dry or wet mode of assay. The principle is very simple, and may be understood by a case in point:—To assay a copper ore containing silver and iron; "we must be careful to use for our positive plate that metal which is the next in the scale of affinity for oxygen to the metal we wish to detect;" and in the case in question to detect and extract the silver, a galvanic pair of silver and copper must be used; then to obtain the copper, a pair of iron combines with either copper or silver, and so on. A report was read from **L. L. BOSCAWEN IBBETSON, ESQ.**, K.R.E., M.E.S., &c. &c., descriptive of the construction and action of Mr. Armstrong's steam electrical apparatus. An idea may be gathered of the quantity of the electricity generated by this instrument, from the fact, that under the unfavourable circumstances of a wet day, which most materially destroyed the insulation of the apparatus, a spark fifteen inches long was obtained from this boiler. A second paper on the Dissection of a Gymnotus Electricus, by **H. LETHELY, ESQ.**, M.B., A.L.S. &c., illustrated by several plates, was read.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

ON THE MANUFACTURE OF THE ALKALINE CHROMATES, AND ON THE ANALYSIS OF CHROME IRON ORE.

BY CHARLES WATT, JUN.

SINCE the publication of my last article on this subject,* I have tried numerous experiments with a view to the employment of cheaper salts than the nitrates in this branch of manufacture, the results of which I hasten to lay before the readers of this Journal, feeling confident that they will effect great reduction in the cost of manufacture, and, consequently, be beneficial alike to the maker and to the public. I have found that the sulphates of potassa and soda may be entirely substituted for the nitrates of those bases by the simultaneous employment of lime, which assists in the decomposition of the sulphate.

The process is as follows:—The sulphate is to be ground, or otherwise intimately mixed with the pulverised ore, and the lime† is then added, which should also be intimately mixed with the mass. It is then to be subjected, for about four hours, to a strong red heat. The nature of the furnace to be employed for the purpose is not of any great importance, so long as carbonaceous matters from the fire are entirely excluded, and the required temperature is attainable. Unless strong heat is employed, no decomposition will take place; the temperature already employed in manufacturing this article from the nitrates will be sufficient, and the furnaces used in every way suitable. The mass should be well raked, about every half hour, to insure the whole of it being sufficiently heated.

It is of much importance in manfacturing the chromates to ascertain the amount of oxide of chromium* contained by the ore, as this forms a guide to the relative quantity of materials to be employed.

I therefore describe the plan which I have always found to answer the required purpose, and which is sufficiently accurate for practical purposes, and has the advantage of being easy of performance.

Take a given weight of the ore, say 200 grains, previously reduced to a fine powder, and intimately mix it with twice its weight of the nitrate of potassa or soda,† adding a little slaked lime to prevent it from fluxing; place it in an iron crucible, and subject it to a strong red heat for about three or four hours; then treat the mass with water to dissolve out the chromate. The insoluble matter having been washed several times until the water has ceased to come off colored, the washings are to be added together and evaporated to concentrate the solution. This being done, it is to be treated with an excess of dilute sulphuric acid to liberate the chromic acid, and then treated with spirit of wine, by which the chromic acid will be reduced to the state of green oxide, which will remain in solution in the preponderance of sulphuric acid employed. A solution of caustic ammonia in excess is then to be added, which will precipitate the oxide of chromium ; the mass is then boiled to evaporate the superabundance of ammonia.

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* *See* THE CHEMIST, Vol. III., p. 387.)

† It is quite immaterial whether the lime be in a state of carbonate or otherwise; but I think, generally speaking, it will be found quite as advantageous to employ that which has been burnt, as it will save trouble and expense in grinding.

* I have found, from numerous analyses, that different samples of the ore vary considerably in the quantity of oxide of chromium which they contain, and I therefore advise every manufacturer to analyse a fair average sample before he makes a purchase.

† It will be as well to use a nitrate in the analysis; the quantity being small it will be of no consequence.

It must now be passed through a filter to collect the oxide, and a little fresh water poured on it to free it from any saline matter : then gently dry on the filter, when it may be entirely removed with ease, as the oxide, which was previously of a very bulky nature, contracts very considerably. It may then be subjected to a dull red heat in a silver, platinum or porcelain crucible, and afterwards its weight ascertained, from which the percentage of oxide of chromium which the ore contains, and, consequently, the amount of sulphate required to convert it into a chromate, may be calculated.

The sample to be analysed should be taken from the bulk after it has been ground, so that it may be a fair average ; and I strenuously advise the maker either to perform the analysis himself, or to have it done for him, previous to his commencing his operations, as, by so doing, he will save the expense attending a second burning, (which is usually the case,) or the waste which will occur from using a preponderance of saline matter.

Proceeding thus, he may ascertain whether the process is complete by taking out a sample from the furnace, and treating it with a slight preponderance of dilute pure nitric acid, then adding chloride of barium; if, on this addition, much precipitate of sulphate is formed, the operation is not completed; but if, on the other hand, only a slight milkiness is produced, the "batch" may be considered as finished.

IMPROVED METHOD OF COMBINING VARIOUS MATERIALS, IN A MANNER NOT HITHERTO IN USE, FOR THE PURPOSE OF MANURE.*

BY SIR JAMES MURRAY, M.D., &c.

The main object of this invention is to produce a compound, which, when mixed with the earth or soil, will generate within it carbonic acid, and a variety of useful salts, and thus increase the supply of nutriment for vegetables, and improve the quality of crops generally.

The means employed by the patentee, for effecting this improvement, consist in drying up and solidifying phosphoric acid, and the common mineral acids, by mixing them with dry, porous, and absorbent matters, vegetable, animal and mineral, such as bran, saw-dust, malt-dust, husks of seeds, brewers' grains, ground rags, pulverised rape or linseed cakes, refuse of flax, leaves and bark of trees, dry tan, silicious sands, peat, or other sandy mould, dry earth, finely sifted cinders, and other like substances. When the acids are absorbed by any of these matters, and converted into powder, they may be more advantageously combined with alkaline substances, and worked into the ground in a dry state ; the chemical action, above mentioned, taking place afterwards, when excited by the moisture present in the soil, or which may subsequently fall upon it.

The acids, used by the patentee, are phosphoric, nitric, muriatic, and sulphuric; the nitric acid being reduced to an uniform specific gravity of 1·200, and the sulphuric acid to 1·600.

The acidulous compounds or powders, which are produced from the acids, and afterwards mixed with alkaline substances, previous to their being used as manure, are five in number; viz. phosphoric compound or powder, acidulous nitric powder, acidulous muriatic powder, acidulous vitriolated powder, and consolidated acid compound.

The phosphoric compound or powder consists of an equal weight of apatite, or phosphorite, and sulphuric or any other of the acids, which are mixed together, and agitated in an earthen vessel, for two or three days; the mixture is then converted into compost, by the addition of a sufficient quantity of the absorbent matters.

The acidulous nitric powder is made by mixing nitric acid with a sufficient quantity of absorbent matter to form a dry compost ; and when it is to be used as a manure, an equal weight of powdered sulphate of lime is combined with it, and the mixture is packed in casks, or earthen jars, from which the air is carefully excluded.

The acidulous muriatic powder is composed in the same manner as that just described, with this exception, that muriatic acid is substituted for the nitric acid.

The acidulous vitriolated powder is produced by mixing sulphuric acid with enough absorbent matter to form a dry powdery compost ; and to this compost, when required for agricultural purposes, an equal weight of dry powdered acidulous sulphate of soda, and also a like quantity of dry powdered acidulous sulphate of potash, are added.

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* *London Journal and Repert. of Arts, Science and Manufactures, &c.*, Jan. 1843.

The consolidated acid compound is formed by combining together two, or more, or even all the acidulous powders before described.

The alkaline substances, with which the acidulous powders are to be mixed, are the supercarbonates, carbonates, and even subcarbonates of soda, potash, and ammonia, and also the carbonate of lime. These substances, the patentee prefers to mix together in equal quantities, and thus produce what he calls the alkaline mixture, which is combined with any of the acidulous powders, in equal quantities, and is then termed the fertilising compost or powder.

The patentee claims, Firstly,—The acid powdery compound (five kinds of which are described), whereby the hitherto liquid acids are rendered solid and portable, and thereby capable of being brought, advantageously and conveniently, into combinations with alkalis, and alkaline earths.

Secondly,—The combination of the acid powdery compound with an alkaline mixture, and the compost or manure thus resulting.

Thirdly,—The compound resulting from the mixture of a mineral acid or acids with a porous powdery substance, so as to mechanically solidify the acid or acids, or absorb it or them, into the powder; and also the combination of such compound with alkaline or earthy carbonates for the evolving of carbonic acid with the soil, and about the roots of vegetables, and for generating salts upon and within the ground itself, instead of spreading such salts, in crystal or powder, over the surface of the land, as heretofore.—*Abstract of Specification.*

IMPROVEMENTS IN MANURE.*

BY JOHN BENNET LAWES, ESQ., ROTHAMSTEAD, HERTS.

The first improvement consists in decomposing bones, bone-ash, bone-dust, apatite, or phosphorite, and other phosphoritic substances, previous to using them as manure, by mixing with them a quantity of sulphuric acid, sufficient to set free as much phosphoric acid as will hold in solution the undecomposed phosphate of lime. The free phosphoric acid is, by this means, enabled to unite itself at once with the various alkaline earths contained in the soil, and the undecomposed phosphate of lime is left in a state of more minute division than can be effected by mechanical means.

The second improvement relates to manures for soils which are deficient in any particular alkali; and consists in manufacturing the manure by mixing phosphoric acid with the alkali required.

The third improvement relates to the formation of manure for those soils from which a crop of wheat, or any other plant, whereof silica forms an essential component part, is desired to be raised. The manure consists of a mixture of silica, in the state of ground flint, sand, crystal, or glass, with either of the alkalis, potash or soda.

The patentee claims, Firstly,—The combination, for the purposes of manure, of bones, or bone-ash, or bone-dust, or apatite, or phosphorite, or any other substance containing phosphoric acid, with sulphuric acid, as aforesaid.

Secondly,—The combination, for the purposes of manure, of phosphoric acid with any of the alkalis, potash, or soda, or ammonia, or any of the alkaline earths, lime, or magnesia, or alumina, as aforesaid.

Thirdly,—The combination, for the purposes of manure, of silica, as aforesaid.—*Abstract of Specification.*

INORGANIC CONSTITUENTS OF PLANTS.*

When any vegetable substance is submitted to the action of heat, the carbon, hydrogen, oxygen, and nitrogen, burn away and disappear, but there remains behind a variable portion of *fixed* matter, which, as it bears so small a proportion to the weight of the plant, was long regarded as the result of accidental circumstances, and of no essential consequence to the plant. But when chemists came to examine this fixed or inorganic residue carefully, when it was found that in each plant, on whatever soil it was grown, the quantity and quality of the ash was the same, when the remarkable discretionary power of absorption which they exercise when in a healthy state was noticed, it became evident that the study of the inorganic constituents of plants is in the art of culture an object of as much importance as that of their organic constituents. The following table exhibits the weight and composition of the inorganic matter contained in 10,000 parts of the three most commonly cultivated kinds of corn, both seeds and straw, and of red clover and sainfoin hay. The author has been for some time engaged in an investigation into the chemical composition of the ashes of vegetables, and intends hereafter to publish a full account of his results: in the meanwhile, the following selection will serve to show how unlike is the quantity of inorganic matter contained in the same weight of the different crops raised by the former.

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* *London Journ. and Repert. &c.*, Jan. 1843.

* From Noad's *Lectures on Chemistry*, page 474.

COMPOSITION OF THE ASH.

NAME.	Weight of Ash from 10,000 grs.	Potash.	Soda.	Silica.	Lime.	Magnesia.	Alumina and Oxide of Iron.	Oxide of Manganese.	Phosphoric Acid.	Sulphuric Acid.	Chloride.	Loss.
Wheat . . .	135	25.	26.	28·5	8·1	10·3	1·3	—	33·5	1·5	·5	·3
Wheat Straw . .	355	14·5	15.	236·4	20·	20·9	18·5	—	20·	4·7	4·2	·8
Barley . . .	228	24·75	26·25	107·5	2·3	16·12	3·8	—	38·5	5·35	2·16	1·27
Barley Straw . .	370	43	16·3	240·5	23·	6·3	18·	1·5	12·75	3·2	4·2	1·25
Oats . . .	270	18·2	17·5	168·	5·75	4·75	2·	—	45·5	5·	2·3	1·
Oat Straw . .	360	114·	32·3	100·	38·75	10·6	1·4	—	6·	20·	35·4	1·55
Red Clover . .	440	98·	32·	68·	126·	40·	23·	—	24·	14·	14·	1·
Sainfoin . .	500	138·5	52·3	45·5	84·7	6·2	8·	—	100.3	36·4	23·4	4·4

Now, as the quantity and quality of the ash is constant in every soil, it cannot be considered as the result of accident; but must arise from some natural law, and the inference must be drawn, that plants possess the power of drawing from the soil that portion of inorganic matter which is adapted to their constitution; and as from the same soil different plants select different quantities of saline and earthy matter, so from the common sap do the bark, the leaf, the wood, and the seed select and retain that proportion which the healthy growth and nourishment of each requires.

That inorganic matter must, equally with carbon, oxygen, hydrogen, and nitrogen, be considered as part of the necessary food of plants, is proved by the fact, that they cannot thrive without it, and that when placed in circumstances where they cannot obtain it, they wither and die. On referring to the composition of wheat-ashes, we find abundance of silica, phosphoric acid, magnesia, lime and potash; consequently, if we sow wheat in a soil which contains neither potash nor phosphoric acid, we cannot expect a productive crop, however rich the soil may be in organic matters; but if we previously manure the soil with bone dust, with ashes of weeds, or other substances which may supply the necessary inorganic elements, these will be absorbed, and the plants obtain their full development. From all parts of the structure of plants, potash, soda, and magnesia are to be extracted in the form of salts of organic acids, though it is not known in what form silica, oxides of iron, and manganese are contained in them; one base may replace another without injury to the plant. Thus, the plants which yield soda when grown upon the sea-shore, if transplanted to the interior, gradually lose the soda and acquire potash in its place. The ashes of oaks or pines, grown upon a granitic or basaltic soil, contain abundance of magnesia and of potash, while trees of the same species will flourish on a limestone soil, and in their ashes lime will be a predominant ingredient.

A knowledge of the chemical composition of the ashes of different vegetables, enables us to understand and explain the circumstances which render a soil barren or productive. There is no plant which does not contain both lime and silica, and few which do not contain potash and magnesia; in most soils these substances are present, but alumina is rarely found in quantity in the ashes of plants, yet this earth is an invariable constituent of all fertile soils; its agency is probably, therefore, of an indirect mechanical kind.*

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* According to Liebig, alumina exercises an indirect influence by its power of attracting and retaining water and ammonia, and it is to this power that he ascribes the benefit derived from using burned clay as a top-dressing, Johnston considers the fact of its absorbing ammonia from the atmosphere as hypothetical, and he thinks that the volatile alkali in clay and oxide of iron, may have been formed in the soil during the oxidation of the iron, or during the decay of animal and vegetable substances.

IMPORTANCE OF AGRICULTURAL CHEMISTRY TO THE FARMER.

To the Editors of the Chemist.

Gentlemen,—

As a cultivator of the soil, I take the liberty of addressing to you a few lines, seeing that you have lately devoted some space in your valuable periodical to Agricultural Chemistry. My object in doing so is, through your columns, to call the attention of my fellow-laborers to the chemistry of their pursuits.

It is now clear that to science, and not to the Legislature, must we look for protection; and to what science can we look with better hopes than to that which, in the hour of need, has so ably assisted the manufacturers, and which has contributed so much to advancing the manufactures of this country to their present state of perfection—to that science which has lent so helping a hand to medicine?

Blind and ignorant, indeed, must be the man who has not seen for some few years past the benefits which are likely to accrue from the application of Chemistry to agriculture. In fact, how can it be otherwise? Literally speaking, we are but manufacturers! we, like the manufacturers of other products, are using certain articles out of which we make others, and we must look to Chemistry for a knowledge of the means of applying these in the most economical manner, and for an acquaintance with the complicated actions and reactions which take place in the vegetable kingdom, to enable us to know how to promote those which are beneficial.

Why, may I ask, has the Chemistry of Agriculture so long remained in the shade until lately? The reason is, I think, obvious: we have been PROTECTED; and I must confess that I, and I dare say that my case is not an isolated one, having been sufficiently protected, have very much neglected the study of Chemistry: had I done otherwise, I doubt not that I should have been a richer man.

I would urge upon all connected with agriculture, 1st, the necessity of having their sons whom they intend to bring up to the same pursuits, taught Chemistry as an essential branch of education; 2ndly, never to purchase any substance, the active part of which is known without properly testing it, as many of the parties who supply farmers think that they "can sell them anything;" and 3rdly, (and this is the principal object of my letter) to communicate, through the medium of your Journal, knowing its standing as a medium of intercourse among manufacturers and agriculturists, any practical or theoretical facts with which they may be acquainted; for instance, the objections to certain manures, under certain circumstances, to the end that we may be of assistance to each other, and may be enabled to benefit by the experience of one another; at the same time, by showing what we are about, we shall be laying our subjects before men of science, from whom we shall doubtless obtain many useful hints.

And now, Gentlemen, I must conclude, by thanking you for devoting a portion of your valuable space to the important and extensive subject of Agricultural Chemistry, and remain,

Gentlemen,
Respectfully yours,
A Tiller of the Earth.

STUDY OF AGRICULTURAL CHEMISTRY BY FARMERS, &c.

To the Editors of The Chemist.

Gentlemen,—

It is with feelings of no ordinary gratification that I perceive from the January Number of your ably-conducted Journal, that it is your intention to devote a portion of your valuable space to subjects connected with the Chemistry of Agriculture.

I feel convinced that it is in your power, from the extensive circulation of your Journal, from the talent displayed in your articles on other topics,—such as the question of Medical Reform, Adulterations and Abuses, with many others which it would be a work of supererogation to numerate,—to render great and invaluable service to us, now that we are compelled to call in science to our aid; it being tolerably clear,—as indeed some of Sir Robert Peel's supporters have candidly told us,—that we have, for the future, little in the way of protection to expect from the Legislature.

It is not my intention here to impugn the conduct of any political party; my object in craving a small portion of your valuable space is to call on my brethren to turn their attention to the importance of the application of chemistry to agriculture, and to express a hope that those among them who have paid attention to agricultural chemistry will eagerly embrace the opportunity now afforded them by the highest Chemical Journal in this empire, of benefiting farmers and their country by the publication in that Journal of such discoveries and improvements as their experiments and ingenuity may have led them to, and I fervently hope that they will in no instance selfishly withhold them from the world. I call on those who, in the vain security of legislative protection, have hitherto neglected the study of chemistry, to pay immediate attention to it; I conjure them, as a brother agriculturist, to embrace the splendid opportunity now afforded to them.

Now that you, Gentlemen, have come to our aid, I feel confident that better days await us; and when I reflect on the good which your periodical has done for manufacturers,—many of the improvements published in it having, to my knowledge, been introduced into extensive practice,—I cannot but feel delighted at the intelligence that its beneficial influence is also to be shed over the class of the community of which I am a member. We have long suffered from the want which you now supply.

In conclusion, Gentlemen, I must apologise for my lengthiness, relying on your efforts in behalf of agriculturists, and hoping that you will be kind enough to accord a small corner of your work to this appeal, the writing of which I wished had devolved on a more capable person than,

Gentlemen,
Your obedient and obliged Servant,
Agricola.

We feel great pleasure in inserting these letters, as they may be taken as an earnest of increasing attention to chemistry among that very large portion of society—the Agriculturists. Our correspondents may rely on our publishing all important contributions to agricultural chemistry. No exertions shall be wanting, on our part, to increase the scientific knowledge of the Farmer. In aid of our endeavors, we solicit all who are engaged in the application of Chemistry to Agriculture, to communicate the results of their observations and experiments.

It shall be our aim to render "The Chemist" as complete a Record of Improvements in Agriculture, as it already is on all hands admitted to be, of all that is interesting to the Scientific Chemist, the Manufacturer, and the Pharmaceutist.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

MEDICAL REFORM.

Since it is now generally understood that very considerable reform, and, we hope, improvement, in the regulation and government of the medical profession is about to take place during the ensuing session of Parliament, through the introduction of a Bill by Sir James Graham, a very important era in its history and management is at hand, and it is deeply incumbent on all interested in its welfare and respectability to be up and doing, that all abuses and dissatisfactions may at once cease and be settled.

We are indeed rejoiced at the arrival of the crisis at which the several important considerations involved in this momentous subject are about to undergo mature deliberation and discussion, and cannot desist from stating that it is incumbent upon all to watch the Bill in every stage, that no clauses conferring advantages on one branch of the profession to the injury of the others may be inserted, nor such enactments passed as may leave the public, as at present, to the mercy of ignorance and imposture. Our readers may be assured that we shall neglect no portion of our duty on a subject in which, from the commencement of this Journal, it is well known we have taken so deep an interest; and we here fearlessly assert, that if the plans we have to suggest are carried, equal benefits will result both to the profession and to the public.

There are few questions which can engage the attention of Parliament that are of greater concern (so long as the profession is divided into distinct branches) than the adjustment, by law, of the functions and privileges of each particular class, and the enforcement of perfect education, and rigid examination of all; for nothing is clearer than that no one who either practises, or even deals in, medicine ought to be allowed so to do until he has received a degree of knowledge commensurate with the branch in which he is about to engage.

It is not our purpose here to discuss the question as to the propriety and advantage of consolidating the various departments, or keeping them distinct as at present; the great objects are—the safety of the public, the respectability of the profession, and the protection of its rights from the encroachments of ignorant persons.

Another question of great importance relates to the continuance of the affairs of the profession in the hands of the present corporate bodies, or vesting them in those of commissioners appointed for the purpose. Of the former, as now constituted and managed, we have so often shown the total uselessness, misgovernment, and unfairness to all but the select few, that we are not required at this time to add any thing on the subject. When the Bill is before the House, we shall present to the proper quarter our objections to their continuance, and accompany them with the plan we have detailed in the second volume of this Journal.*

We may here inquire whether any change in the mode of teaching and examining will be adopted or permitted. To Lectures, as a method of teaching sciences of facts, we utterly object, as being not only the worst plan of imparting knowledge, but as fostering silly vanity and promoting selfish cupidity, and the exclusion from equal advantages of numberless able men, by securing to those who lecture a power to transmit certain benefits to their relatives and favorites, from generation to generation; as has been so admirably exemplified in the cases of those who have had the luck to claim kindred with, or to have truckled to, the Homes, the Coopers, the Clines, and a host of others. Let the plan of lecturing in science be made to give way to the method of teaching, as we have proposed, by Daily Lessons, and at once this unfair dealing is put an end to; and to the substitution of Examinations from written documents, taking the place of the foolish, absurd, and totally inefficient mummery of "*vivâ voce*" and extemporary twaddle, to which candidates have now to submit; and we may entertain some hope of seeing satisfaction in all ranks of the profession, an equal chance of the enjoyment of its benefits, and above all, the advancement of medical science.

Among other improvements we wish to see introduced into the bill, is the extinction of the invidious and totally unmerited power assumed by the Colleges of recognising particular schools, as if at no other could students be taught!† Why should not any man,—by whatever means, or at whatever place he may have qualified, if his knowledge be perfect,—be entitled to a diploma? It often happens that those who are not so fortunate as to be able to pay twenty-five guineas for being instructed in anatomy in a bungling, jumbled, and deficient manner at those schools, will be able to learn much more completely in their own apartments; and we can add, with truth, that they would be able so to do, on our plan, for five guineas, instead of five-and-twenty, which it now costs them,—ten guineas for the lectures, ten for demonstrations, and five for the grinder as he is called, who, in fact, is the only real and effective teacher, and to whom the pupil is entirely indebted for his ability to pass,—and why? because by practice he has made himself acquainted with the ridiculous and often quite outlandish questions put to candidates at the College, and particularly at the Hall. We will give a specimen of one lately proposed at the last-named place to a young man from the country, by a gentleman of the most *redoubtable obesity* of any one of the whole board:—"If I bad an extinguisher large enough to cover the sun, (and all will admit that this could not be a very small one,) how long would it be before the earth would be in darkness?" The question was rightly answered,—a question indeed! but it has this advantage, "ex uno disce omnes," and we are sure it allows us to propose one of far more consequence. Does not such nonsense and folly evince the greatest necessity of an immediate stop? We may surely congratulate our readers that these things have not escaped observation, and if we are not sadly misinformed are very near their end, and those who have so long enacted their parts in these farces will soon be made to retire in the full enjoyment of the "otium cum dignitate." When this event takes place, one of the obstacles to all improvement will be removed. We may look upon it as auspicious of a more liberal and enlightened spirit actuating and guiding the profession.

In former articles,* enough. we imagine, has been said to show how little benefit has been or is likely to be derived from the management of corporate bodies; and the intended extinction of the functions of one, is an evidence of the dissatisfaction of the Legislature, and also of the hopelessness of its creating any more of them. What will the Pharmaceutical Society think of such determination on the part of Government? It will be left to "pursue the laudable course of reforming itself," and God knows it is much wanted; but how has it proceeded in this praiseworthy intention? It commenced with fine promises of producing the most wonder-working results; but in what has it benefited the trade? it has talked largely but worked little and although it has existed nearly two years, we find that it has benefited none except the select *four* who have wriggled themselves into all the benefits the

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* *See* THE CHEMIST, 1st SERIES, Vol. II. page 341.

† The reason is obvious enough: the examiners are mostly lecturers, and of course don't forget the "loaves and fishes."

* *See* THE CHEMIST, Nos. XXII., XXIII. and XXVI.

Society has at its disposal, beyond which they have evinced no concern either for the success of the Society, or for the improvement of the trade.

When it was first established, and it is well known that we used no small share of exertion in its formation, we expected to see Classes in various sciences formed for instruction on subjects connected with Pharmacy; but instead thereof we hear of occasional Lectures (save the mark!) on opium, heat, &c., of such a character as to have the effect of amusing all the intelligent members. We are informed, from good authority,—and what can be better than that of one of the audience?—that some of the persons who have been appointed to lecture are the veriest tyros of whom the profession and the public ever heard. We should not so much have wondered at or objected to the appointment of persons of known ability, but to see placed in the situation of teachers those who have evinced such utter unfitness as we have found them to possess, is indeed too disgraceful and unjust towards those by whose money the whole humbug is carried on and supported. We have always contended that the method of lecturing is the most ridiculous that can be adopted for teaching, and these gentlemen seem as if destined to put a finale to the buffoonery.

We are anxiously waiting to know the next piece of foolery these people will perpetrate, for nothing but the legitimate objects intended at the original formation of the Society seems foreign to their views and capacities. We do not, however, give them credit for so much absurdity as to dare to attempt an application for a charter; if they do, we can foresee the answer they will get and deserve.

Had the Council been sufficiently interested in or alive to the real utility of such a society, it would long since have relieved those parties of their offices and placed its affairs in the hands of persons of ability to carry out its main and proper objects, and have established a well organised method of regulating the trade, and of educating the younger members, so as to have insured it protection and respectability, and to have afforded the public the means of thorough satisfaction and confidence.

ON THE USE OF MALT LIQUORS.

To the Editors of The Chemist.

Gentlemen,—

The question as to whether or not fermented liquors are injurious to man, is one which has been much discussed: many indeed, and various, are the opinions on each side.

Those who argue against their use say, that they are not natural drinks, and that the hand of nature has supplied us *naturally* with all that is necessary or beneficial, in this and every other respect; but these sober sages argue on a wrong basis. We are living altogether in an artificial state, and consequently, require different food. In a state of nature, a man has little or no care; his system is not at one time excited, and at another time depressed, as is the case with the man who lives in these hard times in civilised countries.

That the state of mind exerts as much influence over the digestive organs, as it does over the other organs of the body, cannot be doubted. In some countries where the inhabitants are in a state of uncivilisation, a man can make a meal of tallow candles: this, it is needless to add, we are unable to do; and as a general rule, it will be found that the more civilised a country becomes, the more delicate is the food of its inhabitants. That much of this is due to the climate, as Professor Liebig has shown, must be fully admitted; but this is not the sole cause.

In hot countries, a very liberal use of fermented liquors is decidedly bad; it is adding to the ill effects already produced by the climate. In temperate climes more may be drunk without injury, nay, frequently, with decided benefit; and in cold climates they become almost indispensable, especially to foreigners residing in them.

I am inclined to regard fermented liquors (and I give the preference to ale, porter, and the mixture of the two) in moderate quantities, as not only not injurious, but as being frequently beneficial. It is the abuse of these things, and not their moderate use, that is prejudicial; and so is too much bread, and too much meat, and too much of any other food. The next thing of importance to not taking an excess of these liquors is, that they be taken in a state of purity: this unfortunately is rarely the case with any of them; it is not frequently that they reach their ultimate destination, the stomach, without being shamefully sophisticated. These articles generally leave the manufacturers' premises free from adulteration, but we cannot say so of them when they leave the retailer.

Of all the fermented liquors as drinks, and I have paid some attention to the subject, I give the decided preference to the bitter pale ale, manufactured by Messrs. Hodgson and Abbott; and the reason why I give such decided preference to this is, because, from the many examinations that I have made of it, we are convinced of its purity; 2ndly, because it contains comparatively a small quantity of alcohol; and, 3rdly, because it contains a large quantity of hops. This ale has a peculiar bitter and agreeable taste; and I call the attention of medical men and physicians to it, considering that it would be found of much advantage to patients recovering from low febrile states, and during convalescence after various complaints, as it strengthens the body and gives vigor to the system without exciting the brain: for this purpose I prefer it to wines of any description, from observation of its effects.

I am, Gentlemen,
Respectfully yours,
MEDICUS.

ALBUMINATE OF IRON.

BY MR. A. J. COOLEY.

THIS preparation, better known in France than England, is usually prepared by the following method:—

Albumen, or white of egg, is diluted with distilled water; the mixture is filtered, and a solution of persulphate of iron is added until precipitation ceases, the deposit is then washed and dissolved in alkalized* alcohol. It is very evident, however, that this solution does not answer to its name, and in this state, from the amount of alkali it contains, will prove unfit for administration, in many cases where chalybeate tonics are indicated. It has been my endeavour to remove this objection, and after some experiments for that purpose, I find the solution of albuminate of iron is best made by dissolving its hydrous oxides in the newly diluted and filtered white of egg, which takes up a considerable portion of both the freshly precipitated protoxide and sesquioxide. The liquid may be filtered and will be found by testing to contain a large proportion of metal. In the case of the sesquioxide in particular, the solution will keep for some time without decomposition, and its permanence may be further increased by adding a little alcohol, with which it will mix without precipitation. In this respect it resembles many other preparations of the same oxide. I have now before me two four-ounce phials of this preparation—the one with spirit, the other without any. The simple solution was made about ten days since and placed in a temperate situation, loosely corked, for the purpose of ascertaining its conservative powers. It is barely so clear as it then was, but differs in no other particular. The other phial, to which a little alcohol was added, has kept nearly three weeks without any visible alteration. When tested for iron, they both yield precipitates as before. It may be further remarked, that this preparation is compatible with caustic solution of potassa, and no doubt the other alkalies and their carbonates.

As a therapeutic agent, the albuminate of iron is highly spoken of by M. Lassaigne and other high authorities, who recommend it as a preparation especially adapted by its nature, on theoretical grounds, for combining with the tissues of the body. It will no doubt, ere long, take a prominent situation among the most esteemed of our chalybeates.

ANALYSIS OF THE CAPSULES OF PAPAVER RHEAS.*

BY M. FILHOL.

ALL the large species of poppy contain morphia, in whatever country they may be collected; climate alone seems to cause the proportion of this alkaloïd in each of them to vary.

The small species of poppy have been but little examined, and I do not know that the presence of morphia, in either their juice, or their extract, has been satisfactorily demonstrated. I thought, therefore, that it would not be devoid of utility to undertake their analysis.

The presence of morphia in the flowers of the wild poppy was indicated, some time ago, by M. Chevalier. Riflard, on the contrary, could not find a trace of it in two ounces of extract. As the capsules should, doubtless, contain more morphia than the flowers, I thought that the examination of the latter would be useless, if its absence from the capsules themselves were fully proved.

I shall succinctly detail the results of the analysis which I have made, omitting, as much as possible, the *modus operandi* which I employed.

The capsules which I analysed, were collected a little before their complete maturity; the milky juice which they yielded by incision was so scanty, that I was obliged to take the entire fruit for examination.

The juice of the capsule of the *Papaver Rheas* is acid; if one of these capsules be crushed between two double pieces of litmus paper, the latter is powerfully reddened. The decoction which the capsules furnish with distilled water, is also very acid. Two kilogrammes of capsules yielded, by decoction, a liquor from which I obtained 90 grammes of extract. These capsules, exhausted by pure water, were subjected to decoction with water slightly acidulated with hydrochloric acid.

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* Caustic potassa must be used.

* *Journal de Pharmacie*, Dec. 1822.

The 90 grammes of extract and the acidulated decoction of the grounds were successively examined as follows:—

Fifty grammes of extract were dissolved in 150 grammes of water, and the heated solution was treated by an excess of ammonia; it became slightly turbid, but without giving a precipitate which could be separated by simple repose; the liquor, left to itself for a few days, assumed the form of a jelly, in which some brilliant grains might here and there be seen. This jelly was dissolved in a small quantity of water, and these brilliant grains were instantly precipitated to the bottom of the vessel; it was easy to wash them, for they were insoluble in water. The acids, even when very dilute, dissolved them with facility, and ammonia precipitated from this solution a white powder, insoluble in water and alcohol, and unalterable by heat. The same solution gave a canary yellow precipitate by ammoniacal nitrate of silver, and a white precipitate by the salts of lead. The latter, fused before the blow-pipe, presented well defined crystalline facets; some of these shining grains, fused before the blow-pipe with a little nitrate of cobalt, became of a beautiful blue color; these crystals therefore contained phosphoric acid and alumina. The quantity was considerable, for I obtained 9 decigrammes of it from the above mentioned 50 grammes of extract. This salt was, doubtless, phosphate of alumina held in solution by means of the acids which existed in the liquor, and which the ammonia had precipitated by saturating the latter.

The liquor in which this extractive jelly had been dissolved was filtered, and deposited on the filter a scanty grey precipitate, which was dried and treated with boiling alcohol at 36°. The evaporation of the alcoholic liquor gave a resinous matter which was treated by a small quantity of water acidulated with hydrochloric acid; the resinous matter remained undissolved, the liquor was decolored by a little charcoal, filtered, concentrated, and afterwards precipitated by a few drops of ammonia; a scanty, white precipitate resulted, which was dried and redissolved in boiling alcohol at 36°; the latter abandoned, by evaporation, a few white crystals, decomposable by heat, soluble in the dilute acids and in potassa, turning blue by the salts of iron, strongly reddening nitric acid: this was a small portion of morphia; the quantity which I obtained scarcely amounted to 2 centigrammes.

The solution of extract which had thus furnished me phosphate of alumina and morphia, was precipitated by acetate of lead, the precipitate was washed, then decomposed by hydrosulphuric acid; there resulted from it an acid liquor which was evaporated to a syrupy consistence; it yielded a few white crystalline needles, which heat easily destroyed, and whose solution precipitated the persalts of iron of a blackish blue; not a trace of meconic acid; these few crystals appeared to me to be gallic acid. At the same time as the latter, some small granular, white, deliquescent crystals were deposited on the sides of the capsule. This acid was in such small quantity that I could not submit it to very positive experiments, to determine its nature; by concentrating the syrupy liquor, the latter was powerfully colored; I ascertained that it contained a small quantity of sulphuric acid, arising, doubtless, from the soluble sulphate contained in the extractive solution; the black color appeared to me to be owing to the reaction of this acid on the organic acids with which it was mixed.

The acid decoction of the capsules of the wild poppy was put in contact with an excess of hydrate of lime; after 48 hours, the precipitate was dried and treated with boiling alcohol, which gave a residue in which I could detect the presence of a trace of morphia, but I found in it no narcotin.

It remained for me to determine the saline matters which these capsules contained; for that purpose I burned them in a capsule, and the residue, examined by means of re-agents, was found to be composed of potassa, lime, magnesia, alumina, silica, oxide of iron, combined with sulphuric, hydrochloric and phosphoric acids. The presence of silica in the tissue of these capsules, and that of phosphoric acid especially, which is found in considerable quantities in this plant, appeared to me to be facts well worth attention; it is curious, indeed, to see the wild poppy, which most frequently grows in the midst of canals, furnish a fruit which contains, like the latter, much phosphate; perhaps, the presence of phosphoric acid may not be foreign to the effects produced by the preparations of the wild poppy; however, this is only a conjecture, for it is not proved that the flower of the wild poppy contains the latter salt.

From this analysis, it results that the extract of capsules of wild poppy should be almost devoid of sedative effect, for the quantity of morphia which it contains is excessively small compared with that which an equal weight of opium furnishes. I intend to examine the flowers of the *Papaver Rheas*, in order to compare their analysis with that of the fruit of the same plants.

ON THE PROPER TIME FOR COLLECTING CERTAIN ROOTS.*

BY DR. BUCHNER.

The importance of determining which is the best period of the year for collecting certain medical plants has been pointed out by Buchner. Neutwich employed the following method for the purpose of ascertaining this point. The plan, although short and easy of execution, does not give any idea of the peculiar constituents of the samples.

He cleansed the fresh roots from adhering earth by means of a brush; a certain quantity was then dried in the air, and its loss of weight remarked; it was then boiled several times with water, the extracts evaporated down to oz., clarified with white of egg, filtered, edulcorated, and the filtered solution reduced to 4 oz., and when cold the specific gravity determined.

Only the following roots have as yet been examined:—

NAME OF THE ROOT.	Quantity Employed.	Dried in the Air.			Quantity of Dried Root Extracted.	Spec. Grav. of the Clear Ext. Evap. to 3oz.
	oz.	℥	ʒ	gr.	oz.	
Rad. Taraxaci in Autumn .	12	3	2	52	2	1·120
„ „ in Spring .	12	2	4	12	2	1·095
Rad. Bardaniæ in Autumn .	12	3	2	36	2	1·147
„ „ in Spring .	12	2	0	0	2	1·062
Rad. Saponariæ in Autumn	6	2	0	56	1	1·044
„ „ in Spring .	6	1	5	3	1	1·032
Rad. Cichorei in Autumn .	6	1	5	39	1	1·080
„ „ in Spring .	6	1	2	8	1	1·040

USE OF THE COLUTEA ARBORESCENS.*

BY DR. COLLA.

Dr. C. attributes to this plant contra-stimulant purgative properties, and has derived advantage from its employment, especially in cases in which it was necessary to purge patients whose stomach was refractory to drastics, and whose constitution was enfeebled, and when it was necessary not only to free the intestinal tube from its contents, but also to strengthen it. The analysis of the fresh leaves of the *colutea arborescens* gave albumen, a bitter substance of a resinous nature, tannin, malic acid, a yellow coloring matter, a green coloring matter (chlorophylle) a gummy substance, malate of lime, chlorides of calcium and potassium, and sulphate of lime.

This plant readily yields many of its principles to water, at all temperatures; but the use of the leaves without heat is preferable, or, better still, the tincture arising from the lixiviation of the powder.

The aqueous decoction of the leaves appears to be very active.

The plant does not contain any alkaloïd to which its powerfully bitter taste and cathartic action can be attributed; but there is a bitter principle, of a resinous nature, similar to that of rhubarb and other plants, to which this action is owing. The absence of alkaloïd from the *colutea* makes this plant resemble senna, whose purgative action is not due to a vegetable alkali, but to a mixture of deliquescent salts, bitter resin, and coloring matters.

Finally, the infusion and the aqueous tincture, made cold, contain the resinous principle, separated from the gummy matter, which accounts for the greater activity of these preparations.

NEW TREATMENT OF ITCH.

BY DR. DORNBLÜTH.

The patient must first, at night, cleanse the whole body by means of careful ablution with a warm solution of green soap; then rub with the following liniment:—

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* *Pharm. Central Blatt.*, 1842, p. 688; as given in the *London and Edin. Monthly Journal of Medical Science*, Jan. 11, 1843.

† *Il Filiatre Sebezio*, June, 1842.

℞ Black soap	. . . .	125 grammes.
Powdered root of white hellebore	. . . .	60 „
Warm water	. . .	q. s.

M. and F. S. A. a mixture of syrupy consistence.

This liniment is applied with the palm of the hand, or by means of a brush, and care should be taken to spread it over all the parts of the body which present the slightest traces of exanthemata, especially on the articulations of the four limbs, on the hips, the back and the abdomen. Moreover, the force of the friction ought to be proportioned to the degree of sensibility of the skin. As soon as the rubbed parts commence, after the second, third or fourth application of the remedy, to redden and become the seat of a burning sensation, instead of the itching which was previously felt there, and when no more pimples are seen to appear there, the application of the liniment is ceased.

The day after the last friction, the whole body is rubbed with 125 grammes of black soap, then carefully washed with warm water holding in solution the same quantity of the same soap. It is only necessary afterwards to give clean linen and fresh clothes; the old ones must be submitted, before being again used, to washing and disinfection with sulphurous acid gas, because, without this precaution, they might reproduce the disease.

Very soon afterwards, the skin dries and scales off. In this way cure is obtained in six or eight days, without leaving any bad consequences.

With this mode of treatment, there is no necessity for resorting to any internal administration of medicine: Dr. Dornblüth, who at first prescribed medicines to be taken internally, was ultimately convinced of their utter inutility.

Dr. Dornbluth has cured about six hundred individuals of all ages, by following this topical treatment, and he regards it as preferable to all others, for the following reasons:—

1st. It certainly cures the itch in the shortest possible space of time, and without giving rise to any bad symptom.

2nd. It has the valuable advantage of not betraying, by its odor, the nature of a disease which it is always important to conceal; and in this respect it has a marked superiority over the sulphurous preparations, &c.

3rd. Finally, it has the advantage of being very cheap.

LEAVES OF BETULA ALNUS *L.*, AS A RESOLUTIVE.

BY DR. BÜCHNER, OF STADT-STEINACH.

The topical application of the leaves of the *betula alnus* is much resorted to in domestic medicine in this country, to cause the cessation of the lacteal secretion, and the resolution of tumors of the breast in women who do not suckle and in those who wish to wean their children. To prepare them, they are cut in small pieces, then heated on a plate until they are covered with a liquid which they allow to exude under the influence of heat; it is in this state that a layer of them, of a certain thickness, is formed on the breast.

For the therapeutical employment of these leaves, Dr. Büchner collects them early in the morning; the most efficacious, according to him, are those gathered in spring, in localities much exposed to the morning dew; they are then very resinous and viscous. In all cases, this practitioner recommends the preference to be given to those leaves which are the most succulent. They are strung together, and their internal face is put in contact with the skin which covers the diseased organs; the application must be renewed twice or thrice *per diem.*

FERRUGINOUS PREPARATIONS IN VARIOUS AFFECTIONS.

BY DR. PITSCHAFT, OF BADEN.

Dr. Pitschaft prescribes iron in the following form in the treatment of chlorosis:—

℞ Klaproth's ethereal tincture of acetate of iron	. . .	8 grammes.
Tincture of vanilla	. . .	30 „
Tincture of orange peel	. .	30 „

M. S. A.

20 drops, in a teaspoonful of water, every three hours.

During the use of this medicine, it is advisable continually to administer a tonic purgative composed of aloes and rhubarb.

In some cases of cyanosis in adults, Dr. Pitschaft has employed, with much advantage and with great relief to the patients, the following mixture, but by continuing its use for a long time:—

R Klaproth's ethereal tincture of acetate of iron	. . .	15 grammes.
Tincture of digitalis purpurea		8 „

M. S. A.

20 drops every two hours in a teaspoonful of sugar and water.

Moreover, the patients want to go every day to the water-closet, and it is advisable to watch them in this respect.

The same practitioner considers carbonate of iron, associated with the extracts of bitter plants, one of the best medicines that can be employed in chlorosis; if the patients complain at the same time of very violent palpitations, it is as well to join with it small quantities of digitalis.

SKATE LIVER OIL PREFERABLE TO COD LIVER OIL.*

The disagreeable odor and taste of cod liver oil have, it would appear, led to the substitution of the oil obtained from the liver of the skate (*Raia clavata* and *R. batis*), in place of it. In Holland and Belgium, this oil is preferred to that of the cod, as being both less disagreeable to the taste internally, and also more efficacious in its therapeutic effects. MM. Girardin and Preisser were therefore induced carefully to analyse it, and found it to contain a percentage more of the iodide of potassium than the cod liver oil, whilst in point of purity and other properties it appeared to be superior to it. They therefore recommend it as a valuable substitute for the more nauseous article at present in use.

NUX VOMICA, AS A REMEDY FOR PARAPLEGIA.†

BY DR. M. A. MILILOTTI.

A Veteran, attacked with complete paralysis of the inferior members, of the bladder and rectum, had already been treated by the use of Plummer's specific and a sudorific draught, when Dr. Mililotti determined to prescribe half a grain of the alcoholic extract of nux vomica and two ounces of tincture of wild horse-radish, morning and evening, rubbing the limbs, from the lumbar region downwards, with volatile camphor liniment. The dose of extract, increased to a grain and a half, effected an amelioration in the state of the patient; but at one grain and three quarters, the violence of the tetanic shocks required the suspension of its use for a certain time. The medicine was afterwards again administered, until the amelioration became such that the patient could walk, with the assistance of a stick. After four months treatment, he left the hospital perfectly cured, and capable of resuming his military duties.

NAPHTHALINE AS AN INCISIVE, EXPECTORANT MEDICINE, WITH FORMULÆ FOR ITS ADMINISTRATION.‡

BY DR. DUPASQUIER.

When only one or two centigrammes of naphthaline are put in contact with the tongue, there is speedily experienced the strong, bitter and rather disagreeable taste which is one of the physical characteristics of this hydrocarbon. There is very soon experienced, sympathetically, or rather by continuity, from the *vela palati* and the superior extremity of the pharynx, to the mucous membrane which lines the bronchiæ, a sensation of heat which gradually increases and changes into an incommodious pricking, which soon causes a cough and the expulsion of one or more portions of phlegm, if there be any bronchial mucus or stringy mucosity in the air passages. This effect, which is that of incisive, expectorant medicines, is infinitely more powerful with naphthaline than when it is produced by gum ammoniac, balsam of Tolu, benzoïc acid, &c., which are regarded as the most energetic of this class of therapeutical agents. Naphthaline, moreover, exerts not only a more powerful and inconvenient stimulation, better calculated for producing cough, than that produced by ordinary incisives; it also presents this advantage—that its stimulating influence lasts for a considerable time, and for a long while seems to increase, rather than to diminish, in intensity.

This very remarkable property of naphthaline, which has not been noticed before, led me to think that this chemical substance might be ranked, and even stand high, among medicines which belong to incisive or expectorant treatment. Clinical experiments have completely confirmed this opinion. Naphthaline, employed in cases in which powerful stimulation of the mucous membrane of the bronchia was necessary, and even urgent, has produced excellent results. This was the case, for example, with a very great number of debilitated old men, attacked with chronic pulmonary catarrh, and arrived at a state of threatening suffocation, from the impossibility of expelling the mucous or glutinous matters which obstructed the bronchiæ. I have also remarked this in several cases of humid asthma, with threatened suffocation.

The employment of naphthaline should therefore be preferred to that of known expectorants, even the most energetic ones, in the cases above mentioned. I may add that this new expectorant is by no means dangerous, and presents no inconvenience in administration, beyond a rather disagreeable taste. It is right, however, to desist from the use of naphthaline, as soon as it has produced the desired effect, in order not to habituate the mucous membrane to this stimulation, and to be able to employ it again with success, in case of a recurrence of the bronchial obstruction. It will be understood, that this essentially stimulant substance is not to be administered in acute bronchitis, nor when there is inflammation or only pulmonary irritation.

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* *Edin. Med. and Surg. Journ.*, from *Journ. de Pharmacie*, June, 1842.

† *Observatore Medico*, June, 1842.

‡ *Journal de Pharmacie*, December, 1842.

Naphthaline, which is extracted from coal tar, being obtained by well known means, the method of preparing it, which may be found in all chemical works, need not be given. I will here confine myself to indicating the mode of exhibition which I have adopted, and which appeared to me, in the application, to be most easy and advantageous.

I employ naphthaline, in the dose of 50 centigrammes to 2 grammes, in a lohoch or syrup prepared in the following manner:—

I. LOHOCH OF NAPHTHALINE.

℞ White lohoch	No. I.
Naphthaline	50 centig. to 2 grammes.

F. S. A. a lohoch.

Remark.—Naphthaline, being insoluble in water, must be for a long time triturated with the gum, in order to obtain it in a state of great division, and especially that it may remain for a long time in a state of suspension in the liquid. This lohoch is administered in the dose of a teasponful every quarter of an hour.

II. SYRUP OF NAPHTHALINE.

℞ Napthaline	1 gr.
Dissolve in the smallest possible quantity of alcohol, gradually raise to the boiling point, then triturate with simple syrup	125 gr.

Remark.—The naphthaline completely dissolves in the alcohol by the intervention of heat, but it precipitates as soon as it is mixed with the syrup, which causes it to become turbid and to take the appearance of almond syrup. It might be sufficient to triturate the naphthaline with the syrup, but by employing alcohol there is the advantage of obtaining it in a state of greater division.

Syrup of naphthaline undergoes, by repose, a commencement of separation of its active principle; but it is sufficient to stir it to restore it to its primitive state. However, it is as well not to prepare it until it is wanted; for I have remarked, that in time, a small portion of naphthaline crystallises on the sides of the vessel which contains it.

Syrup of naphthaline should be administered by teaspoonfuls, four and even six times in the hour, until it has produced an abundant expectoration.

OINTMENT OF MANGANESE AND SULPHUR.*

℞ Sublimed sulphur, in powder	8 grammes.
Peroxide of manganese	8 „
White soap	8 „
Lard	3 „

M. and F. S. A. a perfectly homogeneous ointment.

This ointment may be employed with advantage in porrigo.

The following preparation is recommended by Dr. Banger in the same affection:—

℞ Litharge	60 grammes.
Calcined alum	15 „
Calomel	15 „
Lard	1000 „
Venice turpentine	150 „

M. and F. S. A. a perfectly homogeneous ointment.

DETECTION OF ARSENIC BY COPPER.†

BY HUGO REINSCH.

This process consists in acidulating the arsenical fluids with muriatic acid, and boiling them with metallic copper, which then becomes covered by a steel gray crust of metallic arsenic. The separation of arsenic by this method is so complete, that no traces of it can be detected in the residual fluid by means of Marsh's apparatus.

Besides the precious metals, (which are readily distinguished by their color or brillancy,) bismuth and antimony are the only metals which are precipitated in these circumstances; but bismuth is always deposited in the crystalline form, and antimony constantly covers the copper with a metallic pellicle, which is of a violet tint in weak solutions, and grayish white in those more concentrated. These two metals are more precisely distinguished by characters which will be indicated in the sequel.

When the acids, such as the phosphoric, sulphuric, or acetic, containing arsenic, are boiled with metallic copper, the latter preserves its brilliancy unchanged, neither is it affected by any aqueous solution of arsenious acid; but as soon as a few drops of concentrated muriatic acid are allowed to fall on the copper whilst the fluid is still warm, it is instantly covered with the characteristic steel gray crust of metallic arsenic. This test is sensible in a fluid which contains only the

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[*] *Arch. de Pharmacie*, 1842.

[†] *Repertorium für Pharmacie;* as given in *The Lond. and Edin. Monthly Journal of Med. Science*, Jan. 1843.

millionth part of five centigrammes of arsenious acid!

To ascertain if this test is applicable to the detection of arsenic when mixed with food, M. Reinsch prepared a mixture of boiled potatoes, milk, and soup, and introduced 0·025 gr. of arsenious acid into the mixture. He digested the whole with pure muriatic acid, diluted with an equal weight of water, boiled the liquor, filtered it, and treated it with slips of copper; these were immediately covered with the arsenious pellicle, exactly as if the arsenic had been dissolved simply in acidulated water, or the mineral acid. This method thus appears to be susceptible of the same applications as Marsh's process, without some of its inconveniences. It cannot, like the latter, give rise to mistakes from the formation of false stains derived from organic matters, or from the employment of arseniuretted zinc, or from the troublesome frothing of the liquid. All that is necessary for medico-legal purposes is, to digest the contents of the stomach and intestines with diluted pure muriatic acid, and to treat the filtered liquid with slips of copper. In the same way the existence of arsenic in the bones may be demonstrated.

To determine the other properties of arsenic and to obtain conclusive evidence of its presence or absence, the author recommends the following proceeding:—The slip of copper covered with the metallic crust is to be carefully washed with water in the same vessel in which it has been boiled with the suspected liquid, and is then to be very cautiously dried over the flame of a candle. It is then to be slipped down to the centre of a glass tube 16 inches long, one end of which terminates in a capillary orifice, whilst to the other is closely adapted a small bent tube, having its lower end furnished with a perforated cork. The part of the tube where the copper slip lies is then to be heated for a short time with a spirit lamp, when arsenious acid sublimes along the tube in small but well-formed brilliant crystals. If, during the heating, a gentle current of air is blown into the lower orifice of the small bent tube, the arsenious acid forms a white vapor which condenses towards the end of the tube with the capillary orifice. If we wish to test the arsenic in this tube we have only to seal up the capillary orifice cut off this end of the tube, and having dissolved the arsenic, may apply to it the usual liquid tests, or it may be introduced into Marsh's apparatus. If, on the contrary, we wish to obtain the metallic arsenic on a porcelain plate, we are to adapt, by means of the cork, the bent tube to an apparatus for disengaging hydrogen, and inflame the gas at the capillary orifice. Arseniuretted hydrogen is immediately formed, and the metallic crust is obtained on the porcelain; a little arsenious acid is always formed, but by continuing the heat this is equally converted into arseniuretted hydrogen. The disengagement of this gas may be continued or interrupted at will by withdrawing the spirit lamp, for the gas does not present any trace of arsenic when the tube cools, but it appears again on re-applying the heat.

If antimony is present, we obtain somewhat similar results, but the sublimate from this metal is not so manifestly crystalline nor so volatile as that from arsenic. Ordinarily there is also formed by the passage of the current of hydrogen, a layer of metallic antimony in the tube; Reinsch has never observed this to occur with arsenic. The presence of antimonious acid can likewise be demonstrated in the tube as easily as that of arsenic.

The author conceives that, compared with Marsh's method, his own method has undoubtedly advantages. These he conceives to be:—

1. Its execution is easier and requires less time than Marsh's method.
2. It cannot give rise to errors, because the arsenic can be obtained at first in the metallic state, then the form of arsenious acid, and again in the metallic state on the plate of porcelain, without any loss.
3. It is exempt from the inconveniences of the frothing of liquids, the carbonisation of tissues, &c.
4. It equals Marsh's method in point of sensibility, since we are able by it to detect a millionth part of arsenic in a fluid.

POISONING BY CANTHARIDES—CURE.*

BY DR. ROUSSE.

A WEAKLY child, aged 13, in mistake for brandy, swallowed, at three times, about two glasses of the following mixture, which veterinary surgeons are in the habit of employing against scurf, farey and glanders:—

Cantharides in powder .	30 grammes.
Brandy	50 ,,

The first draught was followed by considerable heat in the mouth; the second, which was four or five hours after, produced an increase of heat; and the third, which was soon after the first, was accompanied by intense heat, redness of the mucous membrane of the mouth, a very distinct sensation of burning, and incessant thirst.

An hour had scarcely passed over, when the tongue, certain points of the mouth, and the throat, were covered with more or less extensive blisters, separated by small spaces on which the cantharides had acted but little. The patient complained of intense pains in the whole digestive apparatus, and especially in the middle of the œsophagus. His pulse was very full; his countenance pale, inanimate, and covered with a slight cold perspiration; his eyes were open and without expression. He was threatened with suffocation, vomited his dinner, and could not pass water; there were contortions and an impossibility of remaining quiet for an instant.

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* *Journal de Chimie Médicale*, Dec. 1842.

Treatment.—To constantly keep in the mouth small fishes, and to endeavor to swallow the mucosity with which they are covered; cold camphorated Ptisana lini, compresses of camphorated oil on the abdomen; mucilaginous baths as long as the patient could remain in it.

Three hours after, frequent desire to pass water; some drops of blood escaped from the penis; priapism. The patient twice or three times vomited ropy matters, without any cantharides being found, which had formed a deposit in the bottle that contained them; these vomitings seemed to facilitate deglutition. Pulse smaller, countenance paler, body colder, convulsions less violent, but more frequent, distinct sensation of burning throughout the digestive apparatus; the evacuations decreased.—Same prescriptions. Enmea of decoction of linseed.

Next day, August 11, the little patient appeared revived: the pains which he suffered were so great that he could not rest an instant without being bathed. The priapism was so intense that the least compress of cold water applied to the penis rendered it excessively painful. A fourth of a glass of sanguinolent urine was rendered; a slight semifluid evacuation followed the use of the glyster.—Same treatment. Very cold white lohoch.

August 12.—Pulse rather improved, less prostration, countenance less pale and less discomposed, eyes not so dull, and extremities warmer. The mucous membrane of the mouth, which was the seat of blisters, was so much diminished and reddened, that it was wanting in some places.

Large pieces of mucous membrane were rendered by the action of the glysters.—Same prescription for three days.

The little patient was convalescent on the fourth day. Mucilaginous food was ordered.

POISONING BY THE INHALATION OF IMPURE NITROUS OXIDE GAS.*

BY F. STANLEY, ESQ.

Three young men had provided a bladder containing two quarts of the nitrous oxide, for the purpose of exhibiting its exhilarating effects. One of them applied the bag in the usual manner to his nostrils, and made about ten inspirations of its contents. Only a slight effect was produced, merely a reeling to and fro, as though laboring under intoxication, which state lasted about twenty seconds; when, thinking that sufficient inspirations had not been made, he again breathed the gas for a short time, and suddenly a series of most violent muscular motions resulted, which required the combined strength of his companions to control, and continued with unabated force for full ten minutes, when his efforts relaxed, and, apparently, the effects were subsiding, as he became conscious of his situation; but only a few minutes elapsed before he again exhibited similar forcible movements, striking out in all directions. These alternate intermissions and violent muscular exertions continued for half an hour. In the intervals of the paroxysms his manners and conversation were exactly similar to what is witnessed in the delirium produced by inebriety. On my arrival, finding his pulse beating with most rapid strength, I directed free cold affusion over the head and face, and, opening the temporal artery, took away about ten ounces of blood. Complete success attended these measures,—restoring perfect sensibility,—the patient expressing himself as being not conscious in the slightest degree of all that occurred. Contrary to the usual effect of pure nitrous oxide (which produces no after depressions, unlike other stimuli), intense languor and fatigue were complained of. The young man recovered in a day or two, merely experiencing a throbbing sensation of the forehead, and a sense of constriction and pain over the right hypochondrium, which were most intense on regaining sensibility; consequently gradually disappearing. On inquiry, I found that while preparing the gas from the nitrate of ammonia, the flame was urged too rapidly, and a slight explosion was heard, filling the retort with red vapors. The bladder was immediately removed, and the experimentalists, knowing that decomposition of the nitrate had resulted, feared that the gas was contaminated with nitrous acid and nitrogen, the products of decomposition. They tested it by a single inspiration, and its supporting combustion. Perceiving no indications of impurity, they believed that the bladder was removed from the retort before the impure gas had entered, which unfortunately could not have been the case. The subject of the above remarks had previously, on many occasions, inspired the nitrous oxide, the effects being very transient, and consisting solely of muscular exertion. I am quite at a loss to account for the cessation of the motions and their subsequent renewal, resembling so nearly an epileptic attack. That the sense of constriction on breathing was produced by the nitrous acid vapor I have no doubt, although present in such minute quantity as to be undiscernible by the tests applied.

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* From *The Lancet*, Dec. 10th, 1842.

SYMPTOMS CAUSED BY BUTTER.

On the 19th of April, 1842, M. Bayard wrote to the editors of the *Journal de Chimie Médicale*, detailing symptoms which followed the use of butter that was partially decomposed.

"This butter," says he, "was prepared with customary cleanliness, and was set aside, during the month of December, in a large stone vessel, every churning-day; the provision sent to me might amount to 7 or 8 kilogrammes.

"This quantity had not been obtained at one time, but was the result of the accumulation of several churnings. At each of these spaces, the surface was covered with a whitish layer, *of a peculiar aspect.*"

In the month of January, as soon as the butter arrived, it was employed in M. B.'s kitchen.

It communicated no bad taste to food prepared with it; however, five or six hours after having partaken of it, he was seized with colic, abundant diarrhœa, and some tendency to vomiting.

The cook who had prepared the meal was seized with syncope, nausea and vomiting. This state lasted 48 hours. His daughter, aged three years, had diarrhœa without vomiting.

Tea and baths entirely dissipated these symptoms.

POISONING BY DEUTO-SUBCARBONATE OF COPPER.*

BY M. DEGRANGE.

On the 9th of August, 1842, a workman was found lying in the court adjoining his house; there were several contusions on his head, and it was supposed that he had precipitated himself from the window of his room on the second story. His wife stated that he had not suffered any cause for violent grief; but that he had vomited several times during the previous night, and that he had shown a disinclination to eat. At the tavern where he had been drinking on the night of his being found in this state, was an empty glass, with a bluish circular mark about its middle. He was carried to the *Hôpital St. André* in a comatose state; his face was pale, his eyes fixed upwards; but his respiration, though rapid, was free. There was neither vomiting nor diarrhœa, and the extremities were in a profuse cold perspiration. He died five hours after his admission.

On the *autopsy* of the body, several ecchymosed spots were found on the head; and the surface of the brain was highly congested. In the œsophagus were several large patches of a green earthy substance, possessing all the characters of verdigris. The mucous membrane was softened in several places. The mucous tissue of the stomach contained patches of the same substance found in the œsophagus; there were several ulcerations, and its surface was of a green color. All the intestines were of a similar hue; but evidently not caused by decomposition; in some places there were ecchymoses, and in others softening; these were more evident in the upper half of the duodenum. The large intestines were full of fæcal matter. The heart was filled with black blood, and its inner membrane was of a bright red.

On analysis it was found:—

That the substance in the stomach and intestines was carbonate of copper.

That the fæcal matter contained a salt of copper, as did also the urine in the bladder.

That no poisonous salt was found either in the blood or the heart.

In the remarks on the case, it is asked: Was death occasioned by poisoning from copper? The absence of vomiting and diarrhœa may raise some doubts about it; but if we consider the quantity of the salt of copper found in the intestinal tube, which would have a very different action from what it would when taken in small doses, we cannot hesitate in saying, that the apopleetic symptoms were not only produced, but death also was caused by it, and that the poison was voluntarily taken.

MUSEUM OF THE PHARMACEUTICAL SOCIETY. — ECONOMICAL DONATIONS.

We have much pleasure in announcing that Mr. Jacob Bell has recently enriched this collection with a specimen of bad rhubarb, and another of bad lactucarium. We are surprised to observe that this great liberality on the part of the eminent patron of the pharmaceutists of this country is not more generally imitated; which is the more to be regretted, as many others, whom we could name, could easily furnish the Museum, from their own ample stores, with similar samples of every article in the Pharmacopœia, did they not prefer circulating them for the use of her Majesty's subjects,—a course which they erroneously suppose to be more patriotic than that adopted by Mr. Bell.

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* *Journal de Médecine Pratique de Bordeaux.*

SUBSCRIPTION FOR MADAME COURTOIS, WIDOW OF THE DISCOVERER OF IODINE.

Our ably conducted contemporary, the *Journal de Pharmacie et de Chimie*, announces that Madame Courtois, widow of the discoverer of iodine, (who died about four years ago "poor and unknown,") is in a state of most pitiable distress. We need not follow the example of that Journal in enlarging on the value of the discovery of iodine to Medicine and the Arts; this is sufficiently known. We rely with the utmost confidence on the certainty that our readers will not allow France to outvie us in readiness to relieve such a case as the present. A subscription has been entered into under the auspices of the *Société de Pharmacie*, which, on the 21st of November, 1842, amounted to only 738frs. Surely there is no branch of the community that has not been benefited by iodine, in one way or another, especially as a medicine. Every one should subscribe according to his ability.

Subscriptions are received in Paris, at the office of the *Journal de Pharmacie*, and by M. Vée, *Pharmacien*, provisionary treasurer of the subscription, Rue du Faubourg-St. Denis, No. 42.

LAUDATORY REMARKS AND SUGGESTIONS RELATIVE TO THE "IMPROVED SERIES OF THE CHEMIST."

To the Editors of The Chemist.

Gentlemen,—

Allow me, as one of your very earliest subscribers and correspondents, to congratulate you and your numerous readers on the marked improvement which distinguishes your January Number in every department thereof: I feel persuaded that the promises you have made to enlarge on the more important parts of Chemical Science will be strictly fulfilled, and that your supporters will live in the periodical anticipation of a rich repast being provided for them in every succeeding Number.

I was one of those who long saw the necessity of such a work as "The Chemist," as being essential, both for the information, and in support of the interests of that respectable body for whom it is more especially designed, and believed it would meet with that liberal support which *it has so eminently deserved and received.*

The "suggestions" which I would make for your consideration, are, the introduction of "Lectures" on Chemistry, Botany, and other branches of science connected therewith, and "Extracts" from your medical and scientific contemporaries; these given (occasionally, as space permitted), would, I think, still further (if possible) enhance the value of "The Chemist,"—now decidedly the leading periodical of its kind.

I am, Gentlemen,
Your Wellwisher,
Jan. 16, 1843. Patrioticus.

[We thank our esteemed Correspondent for his friendly communication, as well as for the kindly feeling, display the private letter accompanying it. He and all our readers may rely on the continuance and increase of our exertions to supply them with valuable information.]

HYDRATED PEROXIDE OF IRON.*

BY WILLIAM PROCTOR, JUN.

The following are Mr. Proctor's conclusions:—

1. That hydrated peroxide of iron, even when kept under water, gradually decreases in its power of neutralising arsenious acid.
2. That if kept in the form of a thick magma, it will retain its properties longer than when mixed with much water.
3. That this decrease in power is probably due to a change in the relative proportion of the oxide, and the water chemically combined with it, as well as to an alteration in its state of aggregation.
4. That from the experiments of Orfila, and others, the dry hydrated oxide possesses the power, to a considerable extent, of neutralising arsenious acid, and it should be used in the absence of the moist and recent preparation.
5. That hydrated peroxide of iron may be obtained in a state fit for use in ten or fifteen minutes, by using a solution of the persulphate of iron. And, lastly, That the recent oxide should be used in all cases where it is attainable, in preference to that long kept.

DIABETES MELLITUS CURED BY HYDROCHLORIC ACID.†

BY DR. GENNARO FESTEGGIANO.

A Seaman, after remittent fever, with gastric and rheumatic complications, became affected with an increased flow of urine, which gradually assumed the character of diabetes

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* *The American Journal of Pharmacy*, as quoted in *The American Journal of the Medical Sciences*, Oct. 1842.

† *Il Observatore Medico*, quoted in *Edin. Med. and Surg. Journ.*, Jan. 1843.

MELLITUS. His urine was passed in great quantity, and had a sweet taste; he had a ravenous appetite, constant thirst, became thin, and had the other symptoms which usually attend that complaint. Dr. Festeggiano prescribed a drink acidulated with hydrochloric acid, to which small doses of ipecacuanha were added. At the end of eight days, the peculiar symptoms had notably diminished, the morbid characters of the urine disappeared; and in a month the patient left the hospital cured.

IV. REVIEWS AND NOTICES OF BOOKS.

ON GRAVEL, CALCULUS, AND GOUT: *chiefly an Application of* PROFESSOR LIEBIG'S *Physiology to the Prevention and Cure of these Diseases.* By H. BENCE JONES, M.A. Cantab., Licentiate of the College of Physicians, Fellow of the Chemical Society. London: Taylor and Walton, 28, Upper Gower Street. 1842. pp. 142. 6*s.*

DR. BENCE JONES is indebted for the idea of this work to a suggestion in the *Quarterly Review*, and the manner in which he has carried it out is exceedingly creditable, and induces us to hope that some further application of Liebig's theories will emanate from the same quarter.

The author, in his preface, says,—"I have assumed that the theories of Professor Liebig were probably true, because most of them seemed to me founded on facts which are well known, and to possess the influence of simplicity in a high degree. I have tried to add something to that probability by showing their application to gravel and gout."

This book is divided into two Parts: Part I. being devoted to Gravel and Gout; Part II. to the Stone.

Chapter I. (Part I.) treats of the uric acid diathesis, in which the Author discusses the long unsettled question as to whether Dr. Prout was right in stating that the uric acid in the urine is in combination with ammonia, or Berzelius, in asserting that it is free. From experiments which we have made on urine, we incline to the opinion of Dr. Prout, because carbonic acid, passed through the solution, is capable of precipitating uric acid, and we cannot see what influence this acid can exert on a solution of free uric acid.

Uric acid is less soluble than superurate of ammonia, and the action of carbonic acid, if this salt is present, will be readily understood. The remarks at the conclusion of this chapter lead us to think that the author favors Prout's view.

Chapter II. treats of the production of uric acid from the albuminous tissues; Chap. III., of the production of uric acid from the gelatinous tissues; IV., of the change which the uric acid undergoes after its formation; V., of the treatment of uric acid diathesis; VI., of the gout; VII., of the oxalic acid diathesis, and the production of oxalic acid from uric acid; and VIII., of the phosphatic diathesis, and of the production of the phosphate of lime and magnesia.

Chap. I. (Part II.) is devoted to the nature of the stone; Chap. II., to its removal.

I. ON THE OXALIC ACID DIATHESIS.

Although it appeared, from the examination of the urinary calculi in different collections, that those which contained oxalate of lime bore a very considerable proportion to those in which uric acid was present; and though the former has even been found in some, as in the collection at Wurtemburg, more frequently than the latter, still the number of patients who suffered from the oxalic acid diathesis seemed to bear the greatest disproportion to the number of those in whom the uric acid diathesis existed. The intermixture, and alternation also, of oxalate of lime with urate of ammonia or uric acid was found to be very frequent in calculi. No explanation could be given of these facts. The one seemed to point to some intimate relation between these substances, to some origin from a common cause; whilst the other appeared to prove, that whenever oxalate of lime was formed, it almost always remained and produced a calculus. The researches of Professor Liebig have shown the high probability of the first conclusion, and the microscope, in the hands of Dr. Bird,* has shown the error in the last, by detecting crystals of oxalate of lime very frequently in the urine.

Usually the diathesis has been recognised in consequence of a small calculus of oxalate of lime being passed. Now, however, by means of the microscope, the physician may much sooner obtain evidence of this diathesis, which will be rendered all but certain when a substance is obtained which does not effervesce when mixed with a dilute acid though it does so after a moderate heat has been applied, and again ceases to do so after exposure to a strong heat, with which the ash becomes alkaline, and when dissolved in water gives a white precipitate with oxalate of ammonia.

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* "See *Medical Gazette*, July, 1842."

II. ON THE PRODUCTION OF OXALIC ACID FROM URIC ACID.

The frequent intermixture in calculi of urate of ammonia and oxalate of lime shows some intimate connection between the two, which, by the investigations of Professor Liebig, can now be explained. In mentioning the changes which uric acid undergoes, it has been stated, that oxalic acid may be actually produced from uric acid whenever it is subjected in our laboratories to the imperfect action of oxygen.

The changes which take place may be represented thus :—

$$\left.\begin{array}{lll} \text{Uric acid} & = & C_{10}\ N_4\ H_4\ O_6 \\ \text{4 Water} & = & H_4\ O_4 \\ \text{2 Oxygen} & = & O_2 \end{array}\right\} = \begin{array}{l} \text{Urea} \\ \text{Alloxan} \end{array} \left\{\begin{array}{l} (C_2\ N_2\ H_4\ O_2) \\ (C_8\ N_2\ H_4\ O_{10}) \end{array}\right.$$

$$\overline{C_{10}\ N_4\ H_8\ O_{12}} \qquad\qquad \overline{C_{10}\ N_4\ H_8\ O_{12}}$$

which equal

$$\begin{array}{ll} \left.\begin{array}{l} C_2\ N_2\ H_4\ O_2 \\ C_2\ N_2\ H_4\ O_2 \end{array}\right\} & = \text{2 urea} \\ C_6\ O_8 & = C_6\ O_8 \\ \hline C_{10} N_4\ H_8\ O_{12} & \\ \text{now } C_6\ O_9 & = \text{oxalic acid,} \\ \text{and } C_6\ O_{12} & = \text{carbonic acid.} \end{array}$$

From this it appears that uric acid, with the addition of 3 equivalents of oxygen and 4 equivalents of water, contains the elements of 2 equivalents of urea and 3 equivalents of oxalic acid ; and when the uric acid is further oxidised, that is, when 6 equivalents of oxygen are added to it, then no oxalic acid is formed, but urea and carbonic acid ; so that its production is, as it were, a check in a natural process, analogous to what is called by embryologists arrest of developement, the cause of this check being a want of action of oxygen on the uric acid.

In the oxalic acid diathesis, the oxidising process in the body is carried a step further than it is when the uric acid diathesis exists ; but it still is stopped short of the extent to which it is carried in the state of health. From this we may deduce rules for the prevention of this diathesis, the object being to increase the action of the oxygen on the uric acid, by which it may be changed into carbonic acid and urea. It is only necessary here to refer to the fourth chapter, in which these rules are laid down. Practical experience had established very sufficient principles for the treatment of the uric acid diathesis; but in the oxalic, the want of knowledge of the most usual origin of the oxalic acid had prevented any rational rules for its prevention from being formed. It was known that sugar, by being acted on by nitric acid, might produce oxalic acid ; and on this account some desired their patients to abstain from sugar, others required that no lime should be taken.

We can hardly expect any benefit from these rules, when it is known that the usual source of the oxalic acid is from uric acid, and that it is absolutely impossible to abstain from lime in some form or other, as it exists in almost every thing which is taken as food and drink. Though it is possible that sugar, and perhaps other substances of the non-nitrogenous class, may, by imperfectly combining with oxygen, in the body, give rise to oxalic acid, (and it will be especially interesting to inquire whether this takes place at any time in the course of diabetes, or in diseases related to this, in which there seems to be a want of oxidation of the non-nitrogenous substances,) still the oxygen has evidently a much stronger affinity for the non-nitrogenous than for the nitrogenous substances in the body, and thus the process of oxidation is far more frequently incomplete in the latter than in the former ; so that we should expect oxalic acid generally to arise from the insufficient oxidation of the uric acid, and much more rarely from sugar ; and the alternation of this substance with uric acid in calculi, and the ease with which it is formed from uric acid, lead to the belief that this is the usual origin of oxalic acid. The free oxalic acid passing off by the kidneys meeting with the phosphate of lime, which is secreted both by them and by the mucous membrane of the urinary passages, decomposes it, and oxalate of lime is the result.

The same thing happens when oxalic acid is taken, as such, in the food ; if free, like tartaric acid, it passes off at the kidneys, and combines with the lime which it afterwards meets with. If taken in combination with the alkalis, like tartaric acid, it would probably be decomposed.

The causes, then, of this disease, are in most cases similar to the causes of the uric acid diathesis. Both diseases may be referred to insufficient oxidation, and the treatment must consequently be the same in both. So that it is here sufficient to refer to the chapter on the treatment of the latter: but there is one point which requires separate notice, and this is the lime.

There can be no doubt whatever, that if no lime existed in the body or was taken into the system, no oxalate of lime could be formed; and it is highly probable that an excess of lime in the system may induce the formation of oxalic acid; but some lime is necessary for the bones and the membranes, and it is taken into the system in all solid and liquid food. Now, though it is impossible to obtain food absolutely free from it, and thus to hinder all formation of fresh oxalate of lime, still, by rendering it as free as possible, the rapid increase of a calculus may be prevented. Perhaps of all substances, water is the easiest to render pure, and it is that which usually contains most lime. On this account, in the oxalic acid diathesis, distilled water should always be used in everything for which common water is employed in the state of health. When distilled water cannot be obtained, rain water would be the best substitute; and when this is not to be had, then that which has been purified in the way mentioned in the fifth chapter.

The ashes which are obtained from all flesh invariably contain small quantities of phosphate of lime, and all vegetables contain some lime, and no means can be taken for separating it from vegetable or animal food; and probably the system could not endure the absence of all lime from the food. Such treatment is, therefore, merely palliative, and the curative treatment must be directed to the oxalic acid, and not to the lime.

In conclusion of this notice, we may state, that we consider this book a very important and valuable one; an opinion in which Professor Liebig appears to concur, as he is now superintending its translation into the German language.

Every medical practitioner should possess a copy.

A TREATISE ON MANURES, THEIR NATURE, PREPARATION AND APPLICATION: *With a Description and Use of the most approved British Grasses; to which is added, a Miscellaneous Article on Farming, with an Estimate and Description of an Example Farm of* 300 *Acres. Illustrated with Cuts of Farm Buildings.* By JOHN DONALDSON, Land Steward. London: Robert Baldwin, 47, Paternoster Row. 1842. pp. 416.

NOTHING is so eminently calculated to promote the welfare of particular classes of the community, as the diffusion among them of that kind of knowledge which has a special bearing on their pursuits. The framing of commercial codes is of less importance to the manufacturer or the agriculturist than a sound theoretical and practical acquaintance with the principles on which his branch of industry is based, and with the most rational method of carrying them into execution.

No legislative enactments could have conferred on mankind the same benefits as the inventions of Watt and Arkwright; nor could any degree of protection have compensated our manufacturers for the absence of the chemical and mechanical discoveries of the last half century. Nor has the legislative protection under which, for many years, our agriculturists have slumbered in fancied safety, benefited them to a tithe of the extent that a steady and laudable attention to the cultivation of scientific knowledge and its special application to their pursuits would have done.

Now, indeed, when the hour of danger has almost arrived—when this protection has been considerably abridged, and when powerful interests are energetically at work, endeavoring the entire removal of the small remaining amount, are the agriculturists of this great country, at length becoming convinced that they must in future regard science, not the government, as their guardian angel.

Had this conviction been earlier felt and acted on, much of the panic which lately filled, and which, in many instances, still continues to occupy the minds of agriculturists, would, in all probability, have never existed: they now find that they have been relying on a "broken reed," and that they must at last depend for support on something less delusive; and they have at least this advantage in the change—that science will never desert its dependants.

Our intention here is not to call in question the policy either of the corn laws, or of their repeal or modification: these remarks already, perhaps, too much partake of the character of a political episode.

Toe publicætton. by practical men, of their observations, forms one of the most important means of improvement, and cannot be too highly applauded. We have a very favorable specimen of works of this kind in the production of Mr. Donaldson, whose practical acquaintance with the subject of which he treats it indubitably proves.

The arrangement of this work is as follows:—The Introduction is divided into two parts; the first relating to the origin of soils; the second to the upper soil and the action of manures on it and plants. Chapter I. is devoted to Farm-yard Dung; II., to Excrements; III., Liquid Manures; IV., Dead Bodies and Exuviæ; V., Bones; VI., Vegetable Manures; VII., Lime; VIII., Chalk; IX., Gypsum; X., Marl; XI., Clay, Sand, Moss and Mud; XII., Soot, Soapers' Waste, Coal Ashes, Salt, Saltpetre, and Nitrate of Soda; XIII., Paring and Burning; and XIV., of Irrigation and Warping. A section on Grasses follows, and the work concludes with two chapters on Farming.

This work is a very valuable one to the farmer, in a practical and scientific point of view, and should be possessed by all concerned in cultivation, to whom we cordially recommend it.

The following extract will be interesting to our agricultural readers; the work is so full of extractable matter that selection is difficult.

URINE AS A MANURE.

"Urine (*urina*, Lat., *ορυω*, Gr., to rush out) is the saline liquid secreted in the kidneys of animated bodies, and dropping from them, 'guttatim,' through the ureters into the urinary bladders. It is an excrementitious fluid, by which the body is liberated from superfluous water, salts and animal earths, and defended from corruption. The color of urine is generally light yellow, or pale amber, aromatic smell, and the taste bitter, saltish and nauseous—consistence thicker than water, specific gravity 1·005 to 1·033; the character is neither acid nor alkaline, as it does not change the syrup of violets; it soon putrefies on exposure, becomes turbid and black, the urinous smell quickly succeeds the aromatic, and is itself soon succeeded by a fetid alkaline odor; it deposits a copious sediment and exhales a cadaverous fetor. Putrid urine effervesces with acids, reddens paper stained blue with lmuits or the juice of radishes, and therefore contains an acid. Urine is employed in making phosphorus, volatile alkali, and sal ammoniac, and in the moulds to the produce of nitre-beds; and in a putrid state is very useful in scouring woollens. Human urine is more varied in constituents than any other kind examined: it differs much in composition, according to the nature and quality of the food that is used; and this circumstance may account for tne different results of the analysis of that liquid. All urine contains in solution the elements of vegetables, and is most useful when it abounds in gelatin, urea and albumen. It is very liable to putrefaction, which is much owing to the quantity of albumen and gelatin, and is more rapid in the urine of carnivorous than graminivorous animals.

"Human urine contains:—

1. Water.
2. Acetic acid.
3. Phosphate of lime.
4. Phosphate of magnesia.
5. Carbonic acid.
6. Carbonate of lime.
7. Uric acid.
8. Rosacic acid.
9. Benzoïc acid.
10. Albumen.
11. Urea.
12. Resin.
13. Muriate of soda.
14. Phosphate of soda.
15. Phosphate of ammonia.
16. Muriate of ammonia.
17. Sulphur.

And sometimes muriate of potash, sulphate of soda, and sulphate of lime.

"Urine contains by analysis the following constituents:—

Water	=	933·00
Urea	=	30·10
Sulphate of potassa	=	3·71
Sulphate of soda	=	3·16
Phosphate of soda	=	2·94
Common salt	=	4·45
Phosphate of ammonia	=	1·65
Sal ammoniac	=	1·50
Free lactic acid, lactate of ammonia, animal matter soluble in alcohol, and urea	=	17·14
Earthy phosphate	=	1·00
Uric acid	=	1·00
Mucus of the bladder	=	0·32
Silica	=	0·03
		1000·00

"The urine of the horse has a peculiar smell; after exercise it is emitted thick and milky, at other times transparent, but soon becomes muddy after emission. Exposed to the air, it is soon covered with a crust of carbonate of lime, and the surface has a mucilaginous consistence; it contains—

Carbonate of lime	=	11
Carbonate of soda	=	9
Benzoate of soda	=	24
Muriate of potassa	=	9
Urea	=	7
Water and mucilage	=	40
		100

"Cow's urine resembles that of the horse, has the same odor, and the same mucilaginous consistence, and small crystals form on it when exposed; it contains—

Phosphate of lime	=	3
Muriate of potassa and ammonia	=	15
Sulphate of potassa	=	6
Carbonate of potassa and ammonia	=	4
Urea	=	4
Water	=	65

"The urine of the horse will be the strongest fertiliser, as it contains most alkaline salts. The urine of the graminivorous quadrupeds agrees with human in containing urea, but differs in wanting phosphates and uric acid. The specific gravity of animal urine is generally from 1·015 so 1·020.

"The urine of the domestic animals is much used as a manure in Holland and Belgium, where the straw is wholly consumed as food, and the excrements are not mixed with any substances used as litter. The soiling of cows with succulent food adds much to the quantity and quality of both evacuations, which are mostly swept together into tanks constructed for the purpose, and there mixed with water. The tanks are filled and emptied in succession, and are so placed as to receive the contents from the cow-shed situated on a declivity. Rape cake is also dissolved in the urine, and the contents of the privies of the adjoining villages; and the only preparation required is the solution of the cake and the putrefaction of the contents.

"The urine of 68 cattle and of 32 horses is said to manure 40 acres; and in another statement, that of 44 cattle manures 21 acres on a farm of 200 for rape and flax, and exclusive of the dung. The cisterns cost about £120, and would be higher in this country, and are made of a size to suit the number of stock that is kept: the fermented dung is diluted with water, and then applied to the land by scoops at the rate of 2,500 gallons to an acre. The oozings from the dung, regularly watered, are also used, and the water in which dung and straw have been steeped; and it is said that the straw and solid parts remain the same, and are applied to the manuring of potatoes.

"In China, human urine forms one fourth of all manures, and is always used in a putrefied state; but in the dense population of that country manual labour is mostly employed, and excrements are chiefly depended on as manures. Jars containing animal substances, urine, and putrid materials, are sealed by a mandarin for six months or more; they are then opened, and the contents sold by authority as a prepared manure, in quantities so low as an English pint, after being diluted with four or five times the bulk of water, and is used in gardens, and mostly in drills.

"In Tuscany, Sweden, and in Switzerlandr urine and liquid compositions are spread ove, the grass lands; and even fetid water impregnated with a solution of animal and vegetable substances, is found to act more quickly on grass lands than solid materials. The Flemings and Chinese putrefy the liquid, and then dilute it. Chemistry has recommended it to be used fresh, as putrefaction dissipates the soluble matter, and as in an unmixed state it would contain too much animal matter to form a fluid in a fit state for absorption by the roots of plants. But it is admitted that putrid urine abounds in ammoniacal salts, and though less active than fresh urine, is a very powerful manure.

"In our country, the following results have been obtained from comparative trials; the urine was gathered in a tank, diluted with four times its bulk in water, and applied from a water-cart. On turnips, the effects were inferior to that of farm-yard dung by one half. On potatoes, the roots were watery and unfit for use; and dung should be applied at the same time. On barley, the crop was heavy, but spongy and soft, and lay down. On wheat, the effects were good on dry soils; on wet clays, it should be applied when the land is dry. On oats, the crop was increased by one third; and on grass lands, the application would appear to be in every case the most suitable, and to be used in rather moist weather.

"Much of the land on the Continent, where the application of liquid manures is so general and successful, is under a regular alternate cropping, and frequently manured; and requires rather manures of quick effect than of durability and gradual operation. Something may also depend on the soil, and probably more on the climate; for in our system of farming, where much litter is used, and after all that has been said in favor of liquid manures, it would be a wasteful practice to deprive the farm-yard dung of the benefit of saturation by urine. A man voids one half gallon a day, and in Flemish farming would manure half an acre of land; and one quart of urine yields half an ounce of a dry, fetid substance, and consequently one hogshead will yield seven pounds and a half of solid matter. In most cases, the straw will absorb all the urine that can be made to flow into the yard, and more if it could be got. If straw be scanty, and the moisture abounds, a drain will convey it from each yard to the reservoir or pit in a shady place, floored and built to hold water, where the urine, washings of dairy, and all liquids from the kitchen are discharged from an opening near the top, and absorbed by mould, saw-pit dust, scrapings of roads, scourings of ditches, and other earthy substances. The urine of six horses or cows will mix earth to manure an acre of land in a season; but we have no means of ascertaining the quantity voided by a single animal, so much depending on food, and the preparation. To this pit the contents of privies, and all similar refuse substances, will be carried and spread regularly over the surface, and the earths applied to keep the mass nearly in a solid state. It will require no further preparation, and may be carried out at any season, and will fit any purpose. A door may be made to open at the under end of the pit, to admit a cart for carrying out the dung, which must be made water-tight, and the crevices may be stopped with earth and clay while the pit is filling. By this method the urine will be retained, and applied to the land and earths, which leaves bulk and an earthy residuum in the soil. Urine may also be used by pumping it over the dung in the yards from a tank made to receive it; but, in case of a great abundance from want of straw, the collection of it in a pit, and absorbing it with earths, will be the most economical and the most profitable mode of application."

"Blood,' (*bloden*, Dutch), is the red fluid that circulates in the bodies of animals; and has a saltish taste, a urinous smell, and a gelatinous consistence. On being exposed, it is soon deprived of its volatile parts, which fly off in the nature of sal-ammoniac. It soon congeals, and forms a trembling mass, of which the coagulated part is called the 'crassamentum,' and is highly inflammable on being deprived of its watery particles. The other portion is the 'serum' or thin part, and contains albumen, water, and a ropy mucus. Blood contains water, fibrin, albumen, hydrosulphuret of ammonia, subphosphate of iron, soda, muriate and phosphate of soda, phosphate of lime and benzoic acid. Specific gravity 1·0527. Sea salt, a fine chalky earth, and a small quantity of iron are said to have been found in blood: but the red particles, thought to be iron, are now considered to be a peculiar animal substance, having little relation to that mineral.

Ox blood contains:—

Water . . . . =	905·
Albumen . . . . =	79·99
Lactate of soda and extractive matter . . . . =	6·175
Muriate of soda and potash =	2·565
Soda and animal matter soluble only in water. . . =	1·52
Loss . . =	4·75
	1000·000

Serum of human blood contains:—

Water . . . . . . , . =	905·
Albumen . . . . =	80·
Muriate of potash and soda =	6·
Lactate of soda and animal matter . . . . =	4·
Soda, phosphate of soda, and a little animal matter . . =	4·1
Loss . . . =	0·9
	1000·0

"The buffy coat of blood is fibrin, and closely resembles albumen in chemical properties. The above results differ according to the state of the animated body, and other circumstances.

"Blood contains certain quantities of all the principles found in the animal substances, and constitutes a manure of good quality. It has been much used for fruit trees; but the very limited quantity that can be obtained will deprive it of much attention; and a bed of fine earth, or of ashes, or of saw-pit dust, or any similar substances, to absorb it, would appear to be the most economical preparation. It is mostly mixed with the offal of slaughter-houses, and with the ashes and animal dung in the pits of butchers' shops, where a substance of great value is found for mixing with farm-yard dung."

Mr. Donaldson here and there displays a little illiberality, amounting almost to prejudice, in speaking of the application of the sciences to agriculture, but in some of his observations he is correct.

The work evinces extensive reading on the subjects of which it treats, as well as practical acquaintance with them, and will repay an attentive and studious perusal.

ELEMENTS OF ELECTRO-METALLURGY.

By Alfred Smee, F. R. S., &c. &c. &c. Second Edition, revised, corrected, and considerably enlarged. Illustrated with Electrotypes and numerous wood-cuts. London: E. Palmer, 103, Newgate-street, and Longman and Co. pp. 338. 10*s.* 6*d.*

This work has frequently come before the readers of The Chemist, and few of them we hope have omitted to procure so able a counsellor in the art of working in metals by electrical agency. It is the only work of the kind with which we are acquainted.

The second edition was rendered necessary by the great improvements and discoveries which had been made since the publication of the first.

The eulogistic remarks which we made on the first edition, apply with greater force to the second. Mr. Smee has collected a mass of valuable information, which does him the highest credit, and which we hope will be duly appreciated by the scientific public.

There appears to us to be no necessity for detailing the arrangement of a work already so well known; we will therefore content ourselves with stating that the additions and improvements in this edition, are considerable and valuable.

We give the following extract from the author's history of Electro-Metallurgy:—

"Perhaps in this place I may call the attention of scientific men to the fact, that persons are actually employed by great continental powers to find out every thing new that is discovered in this country, which, in a very few hours, can be conveyed to any part of Europe. This hint is thrown out, not to deter Englishmen from generously giving their discoveries to all countries, but to cause them to be cautious not to mention their processes till they have appeared in some English publication, and thus vindicate the scientific character of our own country. This is the more necessary, as the English receive only the pleasure which the consciousness of being useful must afford, whilst the foreigner receives pecuniary emolument, which singularly increases his desire of being acquainted with the inventions of other countries.

"I may further notice, in order to confirm what I have already stated, that the galvano-plastics of Jacobi, and the electrotype of Spencer, are not inventions the result of inductive reasoning and laborious research, like Professor Wheatstone's electro-telegraph or certain elaborate machines; but merely an application of a fact, formerly known to Daniell, recorded particularly by De la Rue, and observed by hundreds of others, that both Spencer and Jacobi could work only in copper, and in no other metal; whilst, had they prosecuted their subject as a science, they would have seen that the same laws regulate the reduction of all the metals.

"Electro-Metallurgy, as first made known to the world by Spencer and Jacobi, was the simplest of all inventions—the application of a fact known and recorded previously; and it forms another instance of an invention of the greatest magnitude and utility to mankind, arising from more simple beginnings.

"The next discovery, which is fully equal in value to the idea of the electrotype itself, was made by Mr. Murray. He found out that non-conducting substances might have metallic copper thrown down upon them, by previously applying black lead. Mr. Murray's process is extremely simple, and absolutely perfect. The first application of this invention was made in January, 1840; but it is to be lamented that he did not further extend its application and publish his researches, for his method was communicated orally, in the conversations of the Royal Institution, and not by any paper. I lay particular stress upon the value and perfection of plumbago, because some have denied its applicability; and the reader will find, throughout the whole of the work, that I have extended the use of this substance, to the benefit of the public, and to the fame of the inventor. I have made very extensive inquiries, in order to ascertain who really first used plumbago for this purpose; and I have the testimony of several authorities that it was Mr. Murray, whose claim, therefore, to this invention is rendered quite indisputable."

The author pays a well-merited tribute to the talents of Mr. Murray:—

"Since the above was written, I am happy to inform my readers, that the Society of Arts thought fit to record their sense of the value of plumbago to Electro-Metallurgy, by presenting Mr. Murray with a silver medal; and perhaps the merit of Mr. Murray's discovery is much enhanced by black lead not only answering its purpose most fully, but from being so simple, that very few were likely to have thought of its application. I cannot conceive a more perfect substance than black lead for this purpose, for the adhesion of hydrogen to it is so great, that it would rather reduce a metallic salt than be evolved: and this is the very property desirable for Electro-Metallurgy, and in this respect forms a striking contrast with the processes subsequently given by Mr. Solly and Mr. Spencer, though, doubtless, had we not Mr. Murray's process, they would have formed valuable additions to Electro-Metallurgy."

We add the following from Book V., Chap. VI., page 284:—

"VALUE OF ELECTRO-METALLURGY FOR THE DAGUERREOTYPE. PROCESS FOR OBTAINING THE DUPLICATE.

"Papers and periodicals from time to time have contained accounts of the multiplication, in copper, of these splendid works. The success, however, which has attended these operations, I am afraid has not been so great as has been reported. From my own knowledge, I have but little to narrate upon this subject, and this has been confined to the observation of two plates multiplied in this manner. The image on the copper duplicate of one was moderately distinct: but it did not become visible till it had been exposed to the sun's rays. In this case there was nothing left on the original plate, nor was anything visible in either till exposed to the light. On the original, however, the image never returned; but the plate was uninjured, and, therefore, might be employed again. The second plate was a duplicate in copper, from a plate of Dover Castle, executed by Dr. Simon, of that town, who also informed me that the image did not appear for some time. His view on this plate is more faint than that in the first plate, which is further increased by the reflection of the copper being nearly the same at the places where the image is, as where there is no device. There is, also, the peculiar appearance on the plate which is technically called 'the curd.' Dr. Simon informs me, that the impression will bear rubbing when it is apparent, but that the copper deposited upon a great number of plates had not the faintest trace of any view upon it. In one of these cases, the image was transferred from one place to another, rather than multiplied, because there was no increase of images, the image on the silver being only removed to the reduced copper, leaving the original plate quite plain, and polished. In the other original plate, however, a faint image was left.

" Electro-Metallurgy seems to be useful for the Daguerreotype in other ways besides the multiplication of the image, as sometimes a thin layer of gold is deposited, which fixes permanently the image, and gives it a peculiar tint. Perhaps it might be a good plan to platinise or iridise the plate, as the impression might then appear black or white. The process for the multiplication of the Daguerreotype is similar in all respects to that detailed for the multiplication of plain plates. Dr. Simon used the single-cell apparatus ; but I believe that the battery will be found the best adapted. The film of air so often noticed must not be forgotten for the Daguerreotype.

" It is necessary here to call the attention of my readers to the fact, that notwithstanding Monsieur Daguerre was liberally rewarded for his invention in his own country, and France proudly vaunted her liberality in giving his discovery to other nations, yet a patent is taken out in England, which renders it illegal to apply it without the especial licence of the patentee."

LECTURES ON CHEMISTRY; *including its Applications in the Arts.* By HENRY M. NOAD, Mem. of the Chem. and Elect. Socs. of London : Lecturer on Chemistry. London : R. Hastings, and Scott, Webster, and Geary. pp. 504. 12*s*. 6d.

THIS work being now completed, and many of the parts having been noticed in THE CHEMIST, we may now say a few words at parting.

Of course, considering the size and price, no one who is acquainted with the vast extent of Chemistry, and of its numerous facts, will expect it to contain everything ; at the same time, it is sufficiently full and explicit to be put into the hands of students. It has been compiled with much care and industry, and is in every way adapted for elementary study ; and now that the attention of youth is being extensively applied to Chemical science, we have no doubt that the work will find many purchasers among the young.

In the Preface, the author acknowledges the great assistance he has derived from the works of Graham, Kane, Turner, Brande, Thomson, Henry, Daniell, Mitscherlich, Rose, Liebig, and Johnston ; and such being his sources, the accuracy of the work may be relied on.

Part XII. contains a table, exhibiting a general view of the metals, with their compounds with oxygen, chlorine, and sulphur, and their behaviour with re-agents and before the blow-pipe, which is in itself worth the whole price of the part.

The work having been published in parts, has, doubtless, enabled many whose means are limited to possess a useful and valuable elementary treatise on Chemistry. The work has our cordial recommendation.

PROCEEDINGS OF THE LONDON ELECTRICAL SOCIETY — Session 1842-3. Edited by the Secretary. Part VII.

THE receipt of this work is always agreeable to us. It invariably contains valuable and interesting matter.

The present part commences with—" The Effects of a Lightning Storm at St. Blazey, by John A. Phillips, Esq., M.E.S. Among others we may mention the completion of Becquerel's Memoir " On the Electrical Properties of Simple Bodies ;" Mr. Weekes' carefully executed and valuable " Monthly Register of the Electrical State of the Atmosphere," for September, October and November ; and a paper " On the Polarity of the Voltaïc Battery, by J. P. Gassiot, Esq., F.R.S., M.E.S. The longest paper, and it is a most valuable and important one, is by the talented Secretary, C. V. Walker, Esq., " On the difference between Leyden Discharges and Lightning Flashes, and their respective Actions on Vicinal Bodies." There are several other articles, by Jacobi, Wagner, Peclet, Baron F. Wrede, &c.

We are glad to perceive that this Society is in a very flourishing condition ; it does considerable service to electrical science, which, under its auspices, is making great progress in this country.

TO CORRESPONDENTS.

"A CHEMICAL NOVICE."—Apatite has been imported. The residue alluded to will be "white bone ash:" the phosphate of lime is not in the least injured by the burning. Our Correspondent would not find the oil alluded to worth collecting, unless he obtains it in large quantity. The best way to remove the odor is to boil with a little dilute acid.

MR. JACOB GREEN.—18*s*.

A. G.—You will be necessitated to buy the *whole* of Liebig and Gregory's edition of Dr. Turner's *Elements*.

R. C., Whitby.—Evaporate the compound decoction.

"AN APOTHECARY."—The following is Caspar's formula for the electuary of copaiba, as given in the *Pocket Formulary*, a work which you and every one connected with medicine should possess, and which often serves us when memory fails :—

Amygd. decort. .	℥vi.
Althææ pulv. . .	ʒj.
Catechu . . .	ʒss.
Bals. Copaib. . .	℥iij.

H. M.—We cannot inform our Correspondent how Mr. Payne, being an apothecary, managed to insinuate himself into the Pharmaceutical Society, especially into the office of Vice-President. All we know about him is, that he made a "speech," at the meeting of the trade on the 15th of Feb., 1841, which we, who were present, regarded as displaying considerable ignorance of the subject and great deficiency in education on the part of the orator.

THE CHEMICAL SOCIETY OF LONDON.—Not having received any reply from this Society, we wrote, on the 21st ult., to the President, Professor GRAHAM, who, with his usual courtesy, answered our note by return of post, promising a printed copy of the Laws and Constitution of the Society, which we received from him on the 25th.

From the Regulations it appears that a candidate must be recommended by three members, "to one, at least, of whom he shall be personally known;" twelve members must be present and take part in the ballot, and not less than three-fourths must be in his favor. The subscription, payable in advance, is £2 per annum, for a member residing within 20 miles of London, and £1 beyond that distance.

The Transactions of the Society are to be published as occasion may require.

The circumstance of no reply being made to our letter to the Society, dated Dec. 14, 1842, is a highly censurable piece of negligence on the part of that officer of the Society on whom its correspondence devolves, and we consider that it ought to be inquired into.

We have to thank Professor GRAHAM for enabling us to answer our correspondents.

PRIVATE LETTERS have been sent to A.S.; M. P. S.; Medicus; M. D.; D: A. Farmer; Chemicus; An Agriculturist; A Ploughman; Rusticus; A Druggist; A Subscriber; A Constant Reader; A Young Tradesman: all of whom sent their address for the purpose, and inclosed postage stamps.

ERRATA IN No. I.—N. S.

Page 7, col. 1, line 7 from bottom, *dele* in water.

Page 45, col. 1, lines 6 & 7 from top, *for* "exige," *read* exegi, *and for* "perennis," *read* perennius.

NOTA BENE.—*All Communications and Books for Review must be addressed "To the Editors of the Chemist, Care of Mr. Hastings, Publisher,* 13, *Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON THE EMPLOYMENT OF CYANURET OF POTASSIUM IN CHEMICAL ANALYSIS.*

BY J. HAIDLEN AND R. FRESENIUS.

In the Memoir on the preparation and employment of cyanuret of potassium lately published by Professor Liebig, (*see* The Chemist, Vol. III. p. 225,) he has especially shown the great value of this body as a means of reduction and separation in chemical analysis, and has mentioned a number of cases in which separations which could be effected by the processes hitherto employed only with difficulty, or incompletely, may be made in the most simple manner by the employment of cyanuret of potassium. These facts warranted the hope that a still more extended study of the action of this cyanuret on the metallic oxides, sulphurets, &c., might add interesting data to the knowledge of the combinations of cyanogen in general, and to chemical analysis in particular.

We have, therefore, undertaken these investigations in the laboratory at Giessen, at the express invitation of Dr. Liebig, and we have made them with all the scrupulosity required in a work in which no analogies could be admitted, but in which every thing must be decided by direct experiments. In the course of these investigations, we have had the satisfaction of seeing our hopes for the most part realised, and we rejoice, especially for chemical analysis, at having obtained favorable results.

Before proceeding to the description of our investigations, and of the method of distinction and separation which are deduced from them, we may observe that, without a special designation, we always mean by the name of cyanuret of potassium, the mixture of cyanuret of potassium and cyanate of potassa, which is obtained, according to Professor Liebig's process, by the fusion of the ferrocyanuret of potassium with carbonate of potassa. We have especially attached importance to the knowledge of the action of this product in particular on bodies, because its preparation is so simple, that it may be easily obtained, and at little cost, in large quantity; a condition without which even the most valuable reagent could never become generally adopted.

As experiment has shown that the preparation of cyanuret of potassium by the process indicated, has not succeeded with some persons, we may be permitted first to offer a few remarks on its preparation, as well as on the properties which it should possess in order to be applicable to analysis. An attentive observation of the progress of the operation, as Liebig has described it, should lead to this end. To 8 parts of ferrocyanuret of potassium, completely freed from its water of crystallisation, 3 parts of carbonate of potassa are added. The latter should be perfectly pure and dry, especially free from sulphuric acid. It is best to perform the fusion in a well covered iron crucible, because the cyanuret of potassium in fusion easily penetrates the substance of Hessian crucibles, and always removes from them a small quantity of silica. If, from the commencement of the operation, a gentle red heat be uniformly maintained, the reduction and separation of the iron cannot fail to succeed.

The cyanuret of potassium obtained, to be fit for employment as a reagent, should be presented, after cooling, in the form of a milky-white mass, free from grains of iron, and should give, with cold distilled water, a transparent and colorless solution. When an excess of hydrochloric acid is added, and when it is evaporated and treated by water, it should leave no residue (silicic acid). The salts of lead should form in it a perfectly white precipitate; if it has a dirty appearance, it is a proof that the carbonate of potassa was mixed with sulphate of potassa, which the cyanuret of potassium reduced to the state of sulphuret. We prepared, for the reactions, a solution of 1 part of cyanuret of potassium in 6-8 parts of water.

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* *Annalen der Chemie und Pharmacie.*

We will first examine the action of cyanuret of potassium on isolated bodies, and we will afterwards proceed to the methods of distinction and separation based on the results obtained. The properties of cyanuret of potassium allow of our making, in chemical analysis, two applications of them which have little or no mutual relation, since they serve, in the first place, as a means of separation in the humid way, and secondly, as a means of reduction and fusion in the dry way; on account of this circumstance, our work is also divided into two parts.

I. ACTION OF CYANURET OF POTASSIUM ON THE METALLIC OXIDES AND SULPHURETS IN THE HUMID WAY.

We naturally employed in aqueous solution all the salts which we examined in this respect. It appeared to us in general immaterial what acids the oxides were combined with, and whether or not the acid predominate in the solution.

1. *Potassa, soda, and ammonia.*—They do not undergo any change.

2. *Lime, baryta, and strontia.*—If cyanuret of potassium be added to an aqueous solution of one of their salts, a white precipitate of carbonate of lime, baryta, or strontia is formed. It is due to the alkaline carbonate which is formed by the decomposition of the cyanate of potassa contained in the cyanuret of potassium. Boiling favors the complete separation of the alkaline earths. The cyanuret of potassium has not the least influence on these carbonates; that is to say, the precipitate formed in it is as insoluble as in water. If we do not add sufficient cyanide of potassium to completely precipitate the oxides indicated, in the state of carbonates, a portion remains in solution in the state of metallic cyanuret, but the latter is converted in the air, and more promptly by heat, into carbonate.

3. *Magnesia.*—It acts like the alkaline earths; only here there is always formed, by the decomposition of the cyanate of potassa, an ammoniacal salt, which is decomposed only by boiling, when there should be a complete precipitation.

4. *Alumina.*—It is completely precipitated. The precipitate of hydrate of alumina, which is then formed, is quite insoluble, cold, in an excess of cyanuret of potassium. A portion of it is dissolved by heat, which is again precipitated by hydrochlorate of ammonia.

5. *Manganese.*—If a very small quantity of a solution of protoxide of manganese be added to a solution of cyanuret of potassium, the liquid acquires a light red-brown color; by the addition of a greater quantity of the salt of manganese, a bulky, yellow-red precipitate of cyanuret of manganese is formed, which dissolves in a very great excess of cyanuret of potassium. The red-brown liquid obtained, from which the acid cannot separate cyanuret of manganese, is a solution of mangano-cyanuret of potassium. It is decolored and decomposed in the air, allowing hydrated oxide of manganese to separate.

Recently precipitated sulphuret of manganese dissolves only with difficulty by heat, in a large quantity of cyanuret of potassium. The solution, which is of a reddish-yellow color, contains mangano-cyanuret of potassium and sulphuret of potassium. If hydrochloric acid be added to it in excess, hydrosulphuric and hydrocyanic acids are disengaged; chloride of manganese remains in solution.

6. *Iron.*—Cyanuret of potassium forms in the solution of a salt of protoxide of iron, a reddish yellow precipitate, which requires a very great excess of cyanuret of potassium to dissolve it; but by the addition of a solution of potassa, it is easily and promptly dissolved. The liquor contains ferrocyanuret of potassium, whose properties are known. Cyanuret of potassium produces in the solution of salts of peroxide of iron, a brown-red precipitate, similar to the hydrated peroxide of that metal, which is no longer completely dissolved in a very great excess of cyanuret of potassium. The liquid contains ferrocyanuret of potassium.

Recently precipitated sulphuret of iron difficultly dissolves by heat in a large quantity of cyanuret of potassium; if, however, caustic potassa be added, the solution is easily and promptly effected. The brown-yellow liquid contains ferrocyanuret of potassium and sulphuret of potassium.

7. *Cobalt.*—By adding cyanuret of potassium to the solution of a salt of protoxide of cobalt, a flocculent, dirty yellow precipitate of cyanuret of cobalt is obtained, which completely dissolves in an excess of the precipitating agent. If the solution be heated, and if it contain free hydrocyanic acid, cobalto-cyanuret of potassium is formed, which undergoes no change by the action of either dilute acids or the alkalis.

Recently precipitated sulphuret of cobalt dissolves by heat in cyanuret of potassium, with a yellow-brown color. If an acid be added in excess to the solution, hydrosulphuric and hydrocyanic acids are disengaged. Cobalto-cyanuret of potassium remains in solution.

8. *Nickel.*—The mixture of a salt of nickel with cyanuret of potassium gives a flocculent, gelatinous, pale green, and slowly deposited precipitate of cyanuret of nickel, which is easily dissolved in an excess of cyanuret of potassium. The yellow solution contains a double compound of cyanuret of nickel and cyanuret of potassium. Hydrochloric, sul-

phuric, and nitric acids, reproduce the precipitate by decomposing the cyanuret of potassium. But the precipitation is never complete: whether it be operated with or without heat, a portion of nickel always remains in solution. Acetic acid does not decompose the double cyanuret of nickel and potassium.

The sulphuret of nickel, when recently precipitated, easily dissolves when heated with a solution of cyanuret of potassium. By the addition of acetic acid, the colorless liquid disengages hydrosulphuric and hydrocyanic acids, without becoming turbid; but if a mineral acid be added, a precipitate of cyanuret of nickel is at the same time formed.

9. *Zinc.*—A salt of zinc, mixed with cyanuret of potassium, gives a white gelatinous precipitate of cyanuret of zinc, which dissolves with great facility in cyanuret of potassium, forming double cyanuret of zinc and potassium, which is reproduced by the addition of acids, but redissolved in an excess of them, with the exception of acetic acid. Carbonate of zinc also easily dissolves in cyanuret of potassium.

Recently precipitated sulphuret of zinc, when heated with the solution of cyanuret of potassium, gives a limpid liquid, which contains, with sulphuret of potassium, the double compound of cyanuret of zinc and cyanuret of potassium just mentioned. Acetic acid precipitates from this solution a portion of zinc in the state of sulphuret, disengaging hydrosulphuric and hydrocyanic acids.

10. *Cadmium.*—By the addition of cyanuret of potassium to the solution of a salt of cadmium, a white precipitate of cyanuret of cadmium is formed, which acts exactly like the cyanuret of zinc.

Sulphuret of cadmium is insoluble in cyanuret of potassium. Consequently, if hydrosulphuric acid be added to a solution of double cyanuret of cadmium and potassium, all the cadmium is precipitated in the state of sulphuret.

11. *Lead.*—By the addition of cyanuret of potassium to a solution of the salt of lead, a white heavy precipitate in fine grains, which is promptly deposited, is obtained, which is easily separated by the filter, and washed. If a sufficient quantity of cyanuret of potassium be added, hydrosulphuric acid can no longer detect any trace of lead in the filtered liquor. Heat favors the precipitation. The precipitate is quite as insoluble in an excess of the precipitating agent, as in water. It does not contain cyanogen. Nitric and acetic acids readily dissolve it, disengaging carbonic acid. If the lead be precipitated from this solution by hydrosulphuric acid, there always remains, after the evaporation of the filtered liquor, a slight residue of a salt of potassa.

Sulphuret of lead is completely insoluble, even by heat, in cyanuret of potassium.

12. *Bismuth.*—The oxide and the sulphuret of this metal act in exactly the same manner as the corresponding compounds of lead. The precipitate formed by cyanuret of potassium in solutions of bismuth is white, heavy, and easily separated by the filter. It likewise always contains a little potassa.

13. *Uranium.*—If a small quantity of a solution of uranium be poured into a solution of cyanuret of potassium, a transparent yellow liquid is obtained. The addition of a greater quantity of uranium occasions a yellow precipitate of cyanuret of uranium. The latter dissolves only in a very great excess of cyanuret of potassium, and by the aid of heat. The acids form no precipitate in the yellow solution.

This property, which uranium partakes with iron, cobalt, &c., as well as other circumstances, have led us to the conclusion that there must exist a compound of uranium corresponding to the ferrocyanuret, the cobalto-cyanuret of potassium, &c. We are now engaged in a more profound study of this subject.

14. *Copper.*—If cyanuret of potassium be added to the solution of a salt of copper, a green-yellow precipitate of cyanuret of copper is produced, which easily dissolves in an excess of the precipitating agent. The acids occasion, in the yellowish solution, a white precipitate of cyanuret of copper, which is redissolved in an excess of the acids.

Sulphuret of copper readily dissolves in cyanuret of potassium. The yellow solution contains sulphuret of potassium and double cyanuret of copper and potassium. It becomes completely colorless in a short time, without becoming turbid. If sulphuric or hydrochloric acid be added to it in excess, the double cyanuret is decomposed, as well as the sulphuret of potassium, all the copper is again precipitated in the state of sulphuret, and all the hydrocyanic acid is disengaged.

15. *Mercury.*—By adding cyanuret of potassium to the salts of protoxide of mercury, a grey precipitate of metallic mercury, and cyanuret of mercury in solution, are obtained. Deutoxide of mercury, on account of the great affinity of this metal for cyanogen, forms, in all circumstances, bicyanuret of mercury, when it is put in the solid state, or in the state of solution, in contact with cyanuret of potassium. If there be an excess of the latter, it forms with it a double compound. Boiling with the dilute oxacids does not decompose cyanuret of mercury.

Both the sulphurets of mercury are insoluble in cyanuret of potassium. If hydrosulphuric acid be passed through a solution of cyanuret of mercury in cyanuret of potassium, all the mercury is precipitated in the solid state.

16. *Silver.*—By mixing a salt of silver with cyanuret of potassium, there is formed a white coagulated precipitate of cyanuret of silver, which easily dissolves in an excess of the precipitant. If nitric acid be added to the solution, all the cyanuret of silver is completely precipitated. An excess of acid does not dissolve it.

Chloride of silver readily dissolves in cyanuret of potassium; sulphuret of silver is insoluble in it.

17. *Gold.*—By the addition of cyanuret of potassium to chloride of gold, we obtain a yellow crystalline precipitate of cyanuret of gold, which dissolves in an excess of the precipitating agent. Hydrochloric acid reproduces the precipitate, decomposing the cyanuret of potassium: an excess of this acid dissolves it.

18. *Platinum.*—The mixture of chloride of platinum and cyanuret of potassium produces a yellow crystalline precipitate of cyanuret of platinum, soluble by heat in an excess of the precipitating agent. The acid reproduces the precipitate, decomposing the cyanuret of potassium; hydrochloric and nitric acids dissolve it. Ammonia precipitates ammonio-hydrochlorate of platinum from the solution in hydrochloric acid.

19. *Tin.*—The chlorides of tin yield, by mixture with the cyanuret of potassium, precipitates of hydrated protoxide and hydrated deutoxide of tin. The liquid always contains a little tin in solution, as may easily be demonstrated by hydrosulphuric acid, after having boiled the filtered liquid with an excess of hydrochloric acid.

If we treat at the boiling temperature, sulphuret of tin by a great excess of cyanuret of potassium, a small quantity of it is dissolved. The addition of an acid to the filtered liquid, separates from it the dissolved portion in the state of sulphuret. If sulphuret of tin be heated with cyanuret of potassium, the tin is partially dissolved and partially separated in the state of hydrated deutoxide.

20. *Antimony.*—The chloride acts with cyanuret of potassium in the same way as chloride of tin. Sulphuret of antimony is gradually dissolved by prolonged boiling with cyanuret of potassium. The persulphuret is easily dissolved in the solution of this cyanuret, and the acids precipitate it without alteration.

21. *Chromium.*—By mixing the solutions of chromium with cyanuret of potassium, a green precipitate is obtained, which, put in digestion or heated with a very large quantity of this cyanuret, gives a yellow solution, in which the acids produce no precipitate. It contains, as Böckmann has already shown, chromo-cyanuret of potassium.

We terminated our experiments by the study of the action of cyanuret of potassium on some metallic acids, arsenious, tellurous, titanic, tungstic, and molybdic acids. The reactions were, as might be expected, quite similar to those produced by pure potassa.

If we now arrange the metals hitherto examined, according to the manner in which they act with cyanuret of potassium, we have two principal divisions:—

A. *Metals which in the mixture of their salts with cyanuret of potassium do not form compounds with cyanogen.* This series is formed:—

a. Of those which are not precipitated by the cyanuret of potassium;—potassa, soda, and ammonia:

b. Of those which are only partially precipitated by cyanuret of potassium;—antimony and tin:

c. Of those which cyanuret of potassium completely separates from their solutions;—baryta, strontia, magnesia, alumina, lead, and bismuth.

B. *Metals which are converted into metallic cyanurets in the mixture of their solutions with cyanuret of potassium.* They are divided into three groups:—

a. Those whose metallic cyanurets are not soluble in water, but dissolve in cyanuret of potassium, in such a manner as to form binary compounds of the second order (M Cy + K Cy), soluble in water. The acids precipitate the metallic cyanurets from their solutions, decomposing the cyanuret of potassium. These cyanurets are insoluble in nitric acid (cyanuret of silver), or sparingly soluble (cyanuret of nickel), or very soluble (cyanurets of copper, zinc, cadmium, palladium, and platinum).

b. Those whose metallic cyanurets are insoluble in water, but dissolve in a great quantity of cyanuret of potassium. Compounds are formed, in which all the cyanogen should be represented as combined with the heavy metal, to form a compound radical, and the latter with potassium to form a binary compound of the first order (Ex. $\mathrm{Fe\,Cy^2 + 2K}$). The acids do not separate metallic cyanurets from these compounds (iron, cobalt, manganese, chromium, and uranium).

c. Mercury, whose cyanide is soluble in water.

In glancing over what we have so far said, it is easy to see the numerous applications of which cyanuret of potassium is susceptible in analysis; the great facility with which it may be used for separating entire groups of bodies from each other, and the multiplicity of means which it places at our disposal, by the change of some peculiar circumstances, for dividing and again subdividing groups already separated. Our task cannot be, consequently, to enumerate all possible cases in which cyanuret of potassium is applicable to quantitative and qualitative analysis. We prefer confining ourselves, in the continuation of our Memoir, to the description of cases in which this body seems to us, whether in all circumstances, or in certain conditions only, to deserve preference over the means of separation hitherto employed.

(*To be continued.*)

ON THE QUANTITY OF CARBONIC ACID EXHALED BY THE HUMAN LUNGS.*

BY MM. ANDRAL AND GAVARRET.

In this work it is our object to determine the quantity of carbonic acid which, in a given time, escapes by the lungs of man in the healthy and diseased states.

To accomplish this object we have used the apparatus of Dumas and Boussingault.

Through an impermeable mask of sufficient capacity to lodge an entire expiration, and solidly applied to the face, we established a current of atmospheric air by means of glass phials previously exhausted. It was in the midst of this continued current that the subject lived during the experiment. We took care to modify the force of the current by means of a graduated stop-cock, so that the respiration was freely performed, and without effort, either for inspiring or for expelling the gas continually let in and taken out by the drawing out of the phials. Every precaution was also taken to prevent any loss of expired gas, and the drawing out was managed in such a way that the same portion of air could never be submitted more than once to the action of the lungs.

To analyse the gases thus collected, we employed the processes lately used by Dumas and Boussingault with M. Leblanc's modifications, for the analysis of confined air.

Before investigating the extent to which, in disease, the quantity of carbonic acid exhaled by the lungs may vary, it was necessary to determine by more numerous and more consecutive experiments than had previously been made, what was this quantity in the physiological state; and first we proposed to ascertain what influence the three great physiological circumstances of age, sex, and constitution might exercise on the exhalation of carbonic acid by the lungs. Such is the special object of the Memoir which we now present to the Academy, which is, as will be seen, only the commencement of a much more extended work. For, before entering on the pathological questions, we shall also have to examine other physiological influences, such as those of repose and motion, of sleep and its absence, of alimentation, of light and darkness, &c.

All our experiments were also made in the most similar circumstances possible, on subjects who were all healthy, at the same time of the day, between 1 and 2 o'clock, at the same interval between meals, in similar conditions of nutrition, muscular expenditure and moral state.

Finally, to assure ourselves of the value of our processes, we took care to repeat the experiments six times on the same subjects, and the concordance between the results was, in all cases, as great as can be desired in physiological investigation.

At each experiment we collected almost constantly 130 litres of gas; the operation lasted from 8 to 13 minutes each time. Thus, in the first place, the quantities of the products collected were sufficiently considerable for the most minute differences to be appreciated; and, in the second place, the observation was sufficiently prolonged to enable us to conclude from the fact proved, what it really amounted to in the space of an hour. We did not wish to use our results for calculating how much carbonic acid each individual exhaled in the space of twenty-four hours, because it is not yet demonstrated to us that the activity of the pulmonary function remains the same at all hours of the day and especially of the night.

We may mention that, in the explanation of our results, we have generally represented in grammes the quantity of carbonic acid exhaled by the carbon which it contains; for, in the first place, we thus obtain ciphers more easy to retain; and in the second place, especially, it is the quantity of carbon thus burned which it is required to know.

Seventy-five experiments have been made on 62 different individuals, of whom 36 were males and 26 females.

They have shown us that, from the age of 8 years to the most advanced old age, the quantity of carbonic acid exhaled by the lungs, in a given time, varies considerably according to age, sex, and constitution.

At all ages, commencing with 8 years, the exhalation of carbonic acid by the lungs is more considerable in man than in woman. The following are the differences which this exhalation presented to us in the two sexes:—

In man, the quantity of carbonic acid exhaled by the lungs always goes on increasing from 8 to 30 years; from 30 to 40, it remains stationary, or begins to diminish slightly; from 40 to 50 this tendency to diminution becomes greater; finally, from 50 years to extreme old age, the exhalation of carbonic acid diminishes more and more, so that in old people, arrived at the last stage of life, it returns nearly to what it was in children of 10 years of age.

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* *Comptes Rendus*, No. 3, Jan. 16, 1843.

The following ciphers represent the quantity of carbon contained in the carbonic acid exhaled in an hour by the lungs of man at different ages.

A boy, aged 8, burnt in one hour 5 grammes of carbon.

This increased by intermediate degrees to 8·7 gr. in a boy of 15.

After the age of 15, the quantity of carbon burned increases in the following manner:—

At 16 years, 10·8 gr. were consumed in an hour; then this quantity increased to 11·4 gr. from 18 to 20 years, and to 12·2 gr. in the period between 20 and 30, and it remained nearly the same from 30 to 40.

From 40 to 60, the quantity of carbonic acid exhaled in an hour, is represented by only 10·1 gr. of carbon; from 60 to 80, by 9·2 gr.; and, finally, in a man aged 102 years, by only 5·9 gr.

In now following in woman the variations of the quantity of carbonic acid exhaled, we find first, that, in the female child, from the age of 8 years to puberty, this quantity goes on always increasing, as in the male child, but remaining always rather less than in the latter. After arriving at puberty, a most remarkable phenomenon presents itself: this is the sudden arrest of increase of the exhalation of carbonic acid, as soon as the woman has menstruated; whilst soon after puberty this exhalation increases considerably in man, in woman, on the contrary, it remains as it was in infancy so long as menstruation lasts. During all this period of their life, and when they are also in the plenitude of their strength, women consume in carbon which is exhaled from their lungs in an hour, only 6·4 gr., absolutely the same as children of the same sex; while in men the mean of carbon thus burned, which was about 7·4 gr. before 15 years, amounts to 11·3 gr. between 15 and 40.

The time arrives, however, when woman ceases to menstruate, and, which is very remarkable, as soon as menstruation ceases, the quantity of carbonic acid exhaled by the lungs suddenly goes on increasing, and in women of 38 to 49 years, who have left off menstruating, the quantity of carbon, which represents that of the carbonic acid, augments from 6·4 gr. to 8·4 gr., then, as age advances, this quantity again diminishes, thus afterwards following the same laws as in man, from which, and until the period of the cessation of menstruation, woman appears to deviate.

Thus, while in women who are not menstruating, from 40 to 50 years of age, the quantity of carbonic acid exhaled in the space of an hour, amounts to 8·4 gr. of carbon, the mean between 50 and 60 diminished to 7·3 gr., and it was only 6·8 gr. in women of 60 to 80,—a quantity, however, still greater than that which we found in regularly menstruating women of 25 years.

Indeed, in a woman of 82 years, we have found no more than 6·0 gr. of carbon,—a quantity nearly equal to that which the man aged 102 presented.

If in young women the menstruation accidentally ceases, the exhalation of carbonic acid suddenly increases as at the period of return. Thus, at whatever moment of life we examine a woman in this respect, we find that the circumstance of the existence of menstruation always coincides with a diminution of the exhalation of carbonic acid by the lungs.

Such being the influence exerted by menstruation on the exhalation of carbonic acid through the respiratory organs, it was quite natural that we should ascertain what this exhalation becomes in the cases in which pregnancy causes a cessation of the menses. In this respect, we have examined four women in different stages of pregnancy, and in them the quantity of acid exhaled amounted on the average to 8·0 gr. of carbon per hour, and was maintained between 7·5 gr. and 8·4 gr., that is to say, that in them the exhalation of carbonic acid was the same as in women arrived at the period of return.

In individuals of different ages and different sexes, the strength of the constitution, as it is especially represented by the development of the muscular system, exerts considerable influence on the quantity of carbonic acid which in a given time is exhaled by the respiratory organs, but without any violation of the laws above laid down, and age and sex always maintain their influence. Thus the most robust child never exhales as much carbonic acid as the adult, but a very vigorous old man may, as an exception, burn a quantity of carbon equal to that which is ordinarily burned at a less advanced age. The most robust woman, especially if she is menstruating, never exhales so much carbonic acid as the most feeble man of the same age.

The maximum of exhalation which we have met with, was in a young man of 26 years of age, of an athletic constitution, who, in two successive experiments, burned each time 14·1 gr. of carbon. In a man of 60 years, who at his age preserved a constitution at least as strong as the preceding, the quantity of carbonic acid exhaled in an hour was represented by that of 13·6 gr. of carbon. In another of 63 years, of the same constitution as the two last, the quantity of carbon was 12·4 gr. Finally, in an old man who, at the age of 92 retained remarkable vigor, and who, in his youth, had possessed uncommon strength, near 9 gr. (8·8 gr.) of carbon were burned per hour; and, on the other hand, the same quantity was found, in four successive experiments, in a man aged only 45, but who, unlike the above, was of a very spare muscular system, although in good health.

These facts are sufficient evidence of the influence of individual constitutions on the exhalation of carbonic acid by the lungs, and they show to what extent this influence may counterbalance without annihilating that of age and sex.

It is necessary, moreover, in the face of the different facts which we have detailed, to remark that the weight of individuals, although it cannot be considered as without influence, performs, however, in the variations of the cipher of the exhaled carbonic acid, only quite a secondary part. To prove this, it will be sufficient to observe that a woman, of 20 to 30, does not exhale, on the average, more carbonic acid than a girl of 12; that this woman exhales very nearly one half less than a man of the same age, which the difference of weight certainly could not account for, and that a centenarian of a good constitution and large size, yielded no more carbonic acid than a child of 10 years.

A question of very great importance here presents itself. Would not the variations, which we have just noticed, in the quantities of carbonic acid exhaled by the lungs in a given time, be very simply the consequence of a difference in the capacity of the chest, in the extent of the respiratory motions, and consequently in the volume of gas expired? The examination of this difficulty would lead us to speak of pathological facts, which will give us more facility for arriving at its complete solution. We will content ourselves with establishing that these considerable variations, which uniformly progress with age, sex, and constitution, really form a modification in the activity of the forces which regulate in the system the combustion of the carbon.

CONCLUSIONS.

I. The quantity of carbonic acid exhaled by the lungs in a given time, varies according to age, sex, and constitution.

II. In man, as in woman, this quantity is modified according to age, independently of the weight of the individuals.

III. In all periods of their life, between 8 years and the most advanced old age, men and women are distinguished by the difference of the quantity of carbonic acid which is exhaled by their lungs in a given time. All things being equal, moreover, man always exhales a more considerable quantity of it than woman. This difference is particularly marked between 16 and 40, during which periods man furnishes by the lungs, nearly twice as much carbonic acid as woman.

IV. In man, the quantity of carbonic acid exhaled goes on incessantly increasing from 8 to 30, and this continued increase suddenly becomes very great at the period of puberty. From 30 years, the exhalation of carbonic acid begins to decrease, and this diminution takes place by degrees, so much the more appreciable as man approaches nearer to extreme old age, to such an extent, that in the last stage of life the exhalation of carbonic acid again becomes what it was at about the age of 10 years.

V. In woman, the exhalation of carbonic acid increases according to the same laws as in man during his second infancy, but at the period of puberty, at the same time that menstruation appears, this exhalation, contrary to what occurs in man, suddenly leaves off increasing, and remains stationary (at nearly what it was in infancy), so long as the menstrual periods preserve their regularity. At the period of the suppression of the menses, the exhalation of carbonic acid by the lungs perceptibly increases; then it decreases, as in man, as she advances in age.

VI. Throughout the duration of pregnancy, the exhalation of carbonic acid temporarily amounts to the quantity furnished by women arrived at the period of return.

VII. In both sexes, and at all ages, the quantity of carbonic acid exhaled by the lungs is so much greater as the constitution is stronger, and the muscular system more developed.*

INVESTIGATIONS CONCERNING THE METALLIC ACIDS. — ANTIMONIC ACID.†

Memoir IV.‡

BY M. E. FREMY.

The series of investigations which I have undertaken concerning the metallic acids, necessarily led me to the examination of antimonic acid. The new properties which this acid has presented to me must cause it to occupy an important place among the best defined metallic acids: the study of the antimoniates has discovered to me a fact, which I think will be of much service to analytical chemistry and to industry. I am induced by its importance immediately to communicate it to the Academy.

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* This result is confirmed by other facts, in which, in consequence of pathological debilitation of the constitution, the exhalation of carbonic acid by the lungs has been diminished.

† *Comptes Rendus*, No. 4, Jan. 23, 1843.

‡ For Memoirs I. and II., see The Chemist, Vol. III. p. 134; and III., No. II., N. S., Feb. 1843.

Every body knows the difficulty which is experienced in detecting the presence of a salt of soda when it is mixed with a salt of potassa.

The pecuniary advantages which the substitution of the salts of soda for the salts of potassa presents, have given rise to a fraud, which consists in selling under the name of salts of potassa, salts which contain a considerable proportion of salts of soda. This fraud may be attended with serious consequences in industry, for in certain manufactures, as those of glass, certain soaps, chlorate of potassa, and ferrocyanide of potassium, the presence of salts of soda in salts of potassa is always injurious.

It was, therefore, important to find a reagent possessing the property of precipitating the soda without the potassa, and consequently capable of detecting in a salt of potassa the presence of a salt of soda.

In order to make the advantages of the test which I propose for the detection of a salt of soda more intelligible, I detail, in a few words, the new results which the examination of the combinations of antimonic acid with bases has presented to me.

It is known that Berzelius, in his excellent investigations concerning antimonic acid, has already made known a combination of antimonic acid with potassa, which he regarded as a neutral antimoniate, and which was formed of 1 eq. of antimonic acid and 1 eq. of potassa.

I have ascertained that antimonic acid may also form with bases another series of compounds, containing 1 eq. of acid and 1½ eq. of base. These compounds are prepared by calcining the antimoniates of the first series with an excess of base.

There exists also another class of salts, which are formed by the combination of 1 eq. of antimonic acid with 2 eq. of base.

There exist, therefore, three series of antimoniates, which are represented by the following formulæ:—

SbO^3, MO; $SbO^3, 1\frac{1}{2}MO$; $SbO^3, 2UO$.

Antimonic acid, therefore, must be classed among those acids which form with bases different series of salts, as phosphoric and stannic acids, &c. These resemblances will become particularly interesting when, in making known the detail of my experiments, I present in a single work a complete history of the metallic acids.

It was the study of the combination of antimonic acid with bases that led me to the discovery of the process for precipitating soda from its solution, which I now make known.

When antimoniate of potassa, prepared by fusing protochloride of antimony with an excess of potassa, is treated by a salt of soda in solution, a crystalline and insoluble precipitate of antimoniate of soda is formed.

To appreciate the sensibility and the advantages of this test, I submitted it to the following trials:—

The experiments were made with crystallised antimoniates of potassa, of the second and third series.

I have ascertained that antimoniate of potassa can very easily detect, in a liquor, the presence of $\frac{1}{350}$ of salt of soda. The precipitate of antimoniate of soda is formed only after a few seconds agitation.

I have found that the antimoniate of soda which is precipitated is perfectly pure, and does not carry with it any of the salt of potassa.

I examined the action of water on the antimoniates of potassa, and have found that the solution of the salts, diluted with a great quantity of water, formed no insoluble compound. Thus, therefore, the precipitate, which antimoniate of potassa produces in a salt of soda, cannot be attributed to decomposition of the salt of potassa in water.

I have ascertained, besides, that antimoniate of soda is rather soluble in a great excess of carbonate of potassa, but that, when it is required to detect the presence of a salt of soda in carbonate of potassa, it was not necessary to saturate the salt by an acid; for I mixed 1 grain of carbonate of soda with 100 grains of perfectly pure carbonate of potassa, and I could easily recognize the presence of the salt of soda in the solution, by treating it with antimoniate of potassa. In this case the precipitate was not immediately formed.

The preceding facts demonstrate, that antimoniate of potassa may be advantageously employed for detecting the presence of a salt of soda. It is for experience alone to decide whether antimoniate of potassa is destined to render important services to chemical analysis, and whether this reagent should be used for precipitating and estimating soda. I should, however, here announce, that I have already used antimoniate of potassa for determining the quantity of soda contained in a liquid with whose composition I was acquainted, and that the accuracy of the result exceeded my expectations. I took care, in this case, not to operate on very alkaline liquids, which resist the complete precipitation of the soda.

Such are the facts which I communicate to the Academy. By comparing them with the very ingenious process which Gay Lussac has proposed for analysing a mixture of potassium and chloride of sodium, and with the important experiments which Magnus has made on heptaiodic acid, it may be said that manufacturers can now easily detect the presence of soda in potassa, and guard themselves against this fraud.

In an early communication I shall examine the combinations which protoxide of antimony and antimonious acid form with bases, and I shall describe in detail the precautions which must be taken in the estimation of salts of soda by antimoniate of potassa.

ON THE CHEMICAL COMPOSITION OF THE BONES.*

BY R. F. MARCHAND.

(*Concluded from page* 59.)

In Sweden, there is an arable land which, from time immemorial, has grown excellent wheat, without ever receiving manure. In the year 1817, at the invitation of the Swedish Academy of Agriculture, Berzelius examined this earth, and found it to contain small fragments of bone. Boiled several times with water, it gave a solution which was precipitated by tannic acid absolutely like a liquor obtained by boiling the cartilage of the bones. It was consequently concluded that this land had been a field of battle. On examining the soil of the field of the battle of Leipzig, taken from different places and depths, I did not find these properties; but this result is probably owing to the circumstance of the bodies having been buried in the latter case with more care and in separate spots, while in the former they may have been allowed to remain on the earth.

If fossil bones be buried in soils in which they come in contact with different salts, the latter may communicate to them various colors. If they are in contact with sulphuret of copper, they are penetrated by a solution of sulphate of that metal, assuming a green color, and may be used, like a species of turquoise, for making jewels. For this purpose, the fossil teeth of the alligator especially are employed; their color often changes in the air.

The calcination of bones does not destroy alone all the animal substances; it also slightly alters the mineral substances. For example, Berzelius found the following principles in calcined bones:—

	Bones.	
	Of Man.	Of the Ox.
Phosphate of lime, with fluoride of calcium	86·4	90·70
Lime	9·3	1·45
Magnesia	0·3	1·10
Soda	2·0	3·75
Carbonic acid	2·0	3·00
	100·0	100·00

The composition of the bones in different diseases is little known, although we are aware that in some cases they undergo very essential alterations. The diseases which have greatest influence on the composition of the bones are scrofulous affections, and especially rachitis and osteomalacia. In these two affections, the earthy substance of the bone diminishes; it becomes, like those that have been treated by hydrochloric acid, soft, flexible, and incapable of serving for the support of the body. The bones which should sustain it, give way under its weight, and gradually bend, even to breaking; but the action of the muscles alone is sufficient to bend these bones. It is, commonly, easy to bend them, and, especially in children, the legs may be placed on the back, &c.

Bostock and Prösch have submitted these bones to careful examination; from the numbers given, the extraordinary difference in composition between these and healthy bones is quite evident.

	Bostock, Vertebræ.	Prösch, Vertebræ.	Ribs.
Cartilage	79·75	74·64	49·77
Phosphate of lime	13·60	13·25	33·60
Phosphate of magnesia	0·82	0·00	0·00
Carbonate of lime	1·13	5·95	4·60
Sulphates of lime and soda	4·70	0·90	0·40
Fatty matter	0·00	5·26	11·63
	100·00	100·00	100·00

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* *Journal für Praktische Chemie.*

Sir H. Davy examined the proportion of the animal to the earthy substance in rachitic bones; he found—

	Animal Substances.	Earthy Substances.
In the spinous apophysis of a rachitic child . .	40·7	59·3
In the rib . . . . . „	40·8	59·2
In the tibia . . . . . „	74·0	26·0
In a softened pelvis	75·8	24·2

In Bostock's analysis the fatty matter and the cartilage were combined. The proportion of sulphates of lime and soda which it indicates, appear likewise to be rather too high. From Prösch's analysis we perceive the difference of the action which the disease exerts on the various bones, and the formidable preference which it seems to have for those which are most indispensable and most essential as solid points of support.

I had an opportunity of examining the bones of a child affected with rachitis, immediately after death. I likewise used the dorsal vertebræ, as well as the hollow bones and the sternal ribs.

	Dorsal Vertebræ.	Radius.	Femur.	Sternal Ribs.
Cartilage	75·22	71·26	72·20	61·20
Fatty substance . . .	6·12	7·50	7·20	9·34
Phosphate of lime . .	12·56	15·11	14·78	21·35
Phosphate of magnesia .	0·92	0·78	0·80	0·72
Carbonate of lime . .	3·20	3·15	3·00	3·70
Sulphate of lime and soda .	0·98	1·00	1·02	1·68
Fluoride of calcium, chloride of sodium, iron, loss	1·00	1·20	1·00	2·01
	100·00	100·00	100·00	100·00

In this case, the cartilage itself had undergone a very important alteration; it was not possible to convert it into gelatin by boiling, like that of healthy bones. It did not yield chondin. The astonishing deficiency of earthy matter in these bones, which existed here only in such a very extraordinarily small quantity, is explained by the passing of the phosphate of lime into the urine. I had also the opportunity of analysing the urine of the same child, a few days before its death. I found in it five or six times the ordinary quantity of phosphate of lime.

A question here naturally presents itself to the mind:—How is it possible that these insoluble salts, which, during health, are excreted only in such small quantity, are suddenly excreted in such a large proportion? Phosphate of lime possesses, as Berzelius long since remarked, the property of very easily dissolving in lactic acid. If, for example, we require to purify lactic acid colored brown by boiling with bone charcoal, we are obliged first to free the latter from phosphate of lime by means of hydrochloric acid; if this precaution be neglected, the whole of this salt is dissolved by the lactic acid. Now this acid is presented in the normal state of the organism in all its fluids, but in very small quantity; therefore it is the cause of the perpetual passage of the earthy substance of the bones into the urine; and we also find lactic acid itself in this liquid. If, by any circumstance, the quantity of this acid increases in the body, it must also dissolve and eliminate from the organism a greater quantity of the earthy substance of the bones, while it is impossible to swallow sufficient to repair the loss.

We are acquainted with the conversion of some vegetable substances—especially sugar of milk, grape sugar, starch, and gum—into lactic acid by the mucous membrane of the stomach. This transformation, which is operated only slowly in the healthy state of the stomach and digestive organs, may be extraordinarily accelerated. The substances are very promptly and completely converted into lactic acid; this acid exerts a very energetical solvent action on the earthy matter of the bones, continually wastes these organs, and passes with the solution into the urine. The quantity of lactic acid found in the urine of the above-mentioned child, affected with rachitis, was four times greater than ordinary.

The disease, therefore, does not appear originally to be an affection of the bones; but it seems to be the result of a defect in digestion and nutrition. Hence, it is useless to direct the treatment to the bone; it must be applied to the digestive organs, and to the modification of the aliments: none of the latter should contain substances capable of being converted into lactic acid; consequently, they should not consist of vegetable matters, of substances containing sugar, starch, or gum, of milk,* but of other substances of an animal nature, which are at the same time rich in phosphate of lime, and which may, at least, repair the loss, if in ever so small a degree. It seems, therefore, quite absurd to employ such a remedy as madder, to which a curative property is attributed because it imparts a red color to the bones.

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* Children who have been weaned unreasonably late are often affected with rachitis.

Gout is another disease of the osseous system, which likewise causes a chemical alteration. In this affection, the bones themselves are altered, and solid chemical compounds are deposited on their surface, which then act like foreign bodies and provoke inflammation of the surrounding parts. It is especially the articular heads that are ordinarily surrounded with these solid substances. Wollaston found them frequently composed of pure urate of soda, combined with a small quantity of animal matter. In 1793, Forbes suspected the presence of uric acid; but Fourcroy and Guyton de Morveau mistook this acid for phosphate of lime. It was in the year 1797 that Dr. Wollaston proved the correctness of Forbes' opinion. Dr. John, on the contrary, found in a gouty concretion 73 per cent. of animal matter, with an unctuous fatty substance and a small quantity of soda, 10 per cent. of carbonate of lime, and 17 per cent. of phosphate of lime. Some other gouty concretions were, according to the same chemist, formed of 56·2 per cent. of animal substance, with a fatty matter, 3·2 per cent. of carbonate and phosphate of potassa and chloride of potassium, 12·5 per cent. of carbonate of lime with a little carbonate of magnesia, and 28·1 per cent. of phosphate of lime.

Laugier analysed a concretion of this kind arising from the articulation of the knee, and found it formed of 16·7 of membranous animal substance insoluble in water, 16·7 of uric acid, 16·7 of soda, 8·4 of lime, 16·7 of chloride of sodium, and 8·4 of water. There was 16·71 loss, attributable to the carbonic acid and ammonia. This analysis certainly merits very little confidence, but I have quoted it to call attention to the large quantity of chlorine, the indication of which cannot be entirely inaccurate, and which in this case was certainly in combination with sodium.

At the request of M. Cruveilhier, M. Barruel carefully examined a gouty concretion, in which he also found especially urate of soda. Wurzer obtained a result agreeing with that of Laugier; he found—uric acid 20·0, soda 20·0, lime 10·0, chloride of sodium 18·0, chloride of potassium 2·2, animal substance 49·5, and water 10·3.

The bones of the pelvis of gouty persons were examined by Bergmann. They were cellular, light, and easily scaled; they contained much more organic substance than others, a great quantity (17 per cent.) of a bituminous mass, developing a strong odor by heat, little earthy matter of the bones, and fluoride of calcium.

This absence of data determined me to make some investigations on this subject. With this view, I selected bones which were covered with these concretions, and others which presented no traces of them. I analysed the femur, which presented a large tophaceous concretion at the articulation of the knee, and the bones of the fore-arm,—which appeared healthy,—as well as the concretion itself. The latter was formed of—

Urate of soda	34·20
Urate of lime	2·12
Carbonate of ammonia	7·86
Chloride of sodium	14·12
Water	6·80
Animal substance	32·53
Loss	2·37
	100·00

Vogel was the first who observed urate of lime in these concretions: this body, probably, should never be wanting in them. I found in the bones themselves the following composition:—

	Femur.	Bones of the Fore-arm.
Animal substance	46·32	45·96
Phosphate of lime	42·12	43·18
Carbonate of lime	8·24	8·50
Phosphate of magnesia	1·01	0·99
Fluoride of calcium, soda, with chloride of sodium and loss	2·31	1·37
	100·00	100·00

The cartilage was in excess in both cases, since its ordinary proportion is only about 30 per cent. They show, at the same time, a result full of interest, namely, that the local affection does not influence in particular the local composition of the bone, but that the whole osseous system is likewise attacked. Thus fracture of the bones of gouty subjects, even when it is not precisely the locally and mechanically affected bone that is fractured, is always more difficult to cure than that of other bones; it is sometimes quite incurable.

From comparison with the analysis of the concretion adhering to the bone, it is evident that it is not formed by borrowing from the substance of that bone; for the principles wanting in the latter are not found in the concretion. I found it impossible to discover in the bones the substances detected in the latter. It was in vain that I sought for uric acid, and it was only in the portions of the bone nearest to the concretion that it presented a small quantity of it.

Sometimes the bones present extraordinary excrescences; hence considerable exostoses, which, not dangerous of themselves, become injurious by compressing, displacing, and irritating the soft parts, and determining painful and dangerous affections. M. Lassaigne has examined the composition of an exostosis, as well as that of a bone which was thickened of itself. He found the following composition (I designate by I. the thickening which was formed of itself, by II. the surrounding healthy bone, and by III. the exostosis):—

	I.	II.	III.
Animal substance	43·0	41·6	46·0
Soluble salts	14·2	8·6	10·0
Carbonate of lime	6·5	8·2	14·0
Phosphate of lime	36·3	41·6	30·0
	100·0	100·0	100·0

The thickening as well as the exostosis contained, therefore, more animal substance and more soluble salts than the healthy bone, and the exostosis more carbonate of lime. It is evident, however, from this comparative analysis, that exostosis is not a general disease of the osseous system, but simply a local affection.

ON THE ELECTRIC CURRENT OF THE MUSCLES OF LIVING OR RECENTLY KILLED ANIMALS.*

EXTRACT OF A LETTER FROM M. MATTEUCCI TO M. DE HUMBOLDT.

I. The signs of the proper current of the frog, demonstrated by the galvanometer, increase in the same instrument in the act of contraction.

I had in vain endeavored to make my pile of frogs contract with an electric current; a difficulty which I had not at first expected presented itself; a portion of electric current always takes the course of the wire of the galvanometer, on account of the bad conductibility of the arch (*arc*) and of its length. A physiological fact, formerly discovered by M. de Humboldt, served me in this experiment. I prepared a pile of frogs by placing, as usual, the legs of one of the frogs on the nerves of the other. I touched the extremities of this pile with the two platinum leaves of the galvanometer. I first obtained a certain deflection; the needle afterwards returned, and, after having oscillated, maintained a deflection always inferior to the first. When this happened, I touched, with a fine brush dipped in a solution of potassa, the points of my pile where the nerves and muscles meet. A slight touch was sufficient to make the frogs contract. If the experiment is well made, and if care be taken to touch gently and nearly at the same time, very moderate contractions are perceived in the frogs, and are continued for a few seconds. No extreme point of the frogs must be touched with the alkali, in order that the alkali may not come in contact with the platinum leaves. At the same time as the frogs contract, the needle of the galvanometer is seen to deflect more, to arrive at a certain degree, then again to descend to 0°, which happens even when the frogs have been touched with alkali, after a certain time.

The following are the numbers of an experiment:—Pile of five frogs; the first deflection was 28°, the needle stopped at 5°. On the contact of the alkali, when the frogs contract, the needle rises to 2°, where it remains for a few seconds, and again descends to 5°, 4°, &c.

I waited until the needle was again steady, and I touched the frogs again with alkali: the contractions were wanting and the needle suffered not the least increase of deflection; on the contrary, it continued about 0°.

I took frogs which had been prepared 30 hours; I formed a pile and touched them with alkali: the needle did not deflect. It was easy to ascertain that the alkali no longer produced contractions, for I have seen the legs of frogs contract with alkali, 40 hours after preparation.

I shall continue these investigations; but it seems to me that I may draw from them the conclusion which I have already arrived at, and which confirms the explanation given by M. Becquerel, of facts contained in my second Memoir.

Other experiments, of which I am now about to speak, lead to the following conclusions:—

II. The muscular electric current, which I shall in future call the muscular current, is found in all muscular masses, of every animal.

I have taken pectoral muscle of a pigeon, muscles at the back of a rabbit, pigeons' hearts, muscles of the tench, and portions of an eel which I had skinned: I arranged piles with these different muscles in such a manner as to make the interior of the muscle touch the tendinous surface of the next muscular element. In all cases, I have obtained a current which goes from the interior of the muscle to the surface; the signs of this current, which increase with the number of elements, cease after a certain time, which is so much the shorter as the animal is the higher in the scale. The following are a few numbers:—

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* *Comptes Rendus*, No. 4, Jan. 23, 1843.

7 elements, or half-legs of frogs, gave	37°
7 „ of eel . . . „	15°

Fifteen minutes after, I obtained—

7 elements of frog . . .	18°
7 „ of eel . . .	9°

The first pile, as is evident, diminished rather more in proportion than the second.

III. In studying the muscular current of animals killed by sulphuretted hydrogen, it was found that this current was considerably weakened; it is the same with the proper current of the frog.

As death is almost instantaneously caused by this gas, I introduced the animals into it, and at the same time I prepared similar animals which were not submitted to the action of the gas.

12 legs of healthy frogs gave .	48°
12 „ of poisoned frogs „ .	35°

I opposed the two piles to one another, and obtained a differential current of 25°.

With the legs of these same frogs, which I cut in half, I prepared two piles for studying the muscular current.

12 half-legs of healthy frogs, gave	30°
12 „ of poisoned frogs „	5°

By opposing them, I obtained a differential current of 25° to 26°.

IV. I found in all warm-blooded, as well as in cold-blooded animals, that cooling considerably weakens, and sometimes causes to disappear, the signs of the muscular current, and especially in the former.

V. I introduced into the stomachs of frogs a solution of extract of opium, and I found that the muscular current was in general weakened. I have seen three individuals, taken in a state of super-excitation, which it was sufficient to touch on the table on which they were, for them to jump, so that the signs of their muscular current were not weakened.

VI. I determined, with all the accuracy which is possible in this kind of experiment, the conductibility for the electric current of the substance of the nerves, of the brain, of the spinal marrow, and of muscle.

For that purpose I employed the principle of derived currents. I put in a contiguous series, pieces of muscle, of nerve, of brain, and of spinal marrow, of nearly the same dimensions. I passed an electric current through this arrangement, and I waited until the deflection was constant. Then I touched, with two platinum points, united to the extremities of a good galvanometer, two points of this circle; I touched sometimes the muscle, and sometimes the other parts,—the two points were moveable; and I stopped when I found the same derived current. It is known that, according to the conductibility of the arch (*arc*), it is necessary to keep the two points more or less apart. The conductibility of the muscle is much superior to that of the nerves, spinal marrow, and brain, which do not differ much from each other. The difference of conductibility between the muscular substance and the others is as four to one.

I continue to work, in order to render the book, which I am preparing on the electro-physiological phenomena of animals, as complete as possible. My colleague, M. Savi, is occupied with the anatomy of the torpedo, and M. Piria with the analysis of the substance of the electric organ.

ANALYSIS OF THE CYANURETS, SULPHUROUS COMPOUNDS, &c.[*]

BY M. V. GERDY.

In May last, in a note which M. Dumas was kind enough to read to the Academy, I observed, incidentally, that the iodic solution acted on the cyanurets as on the sulphurets: this fact being ascertained, I thought that it might be made use of for the analysis of the cyanurets, soluble of themselves, or by a combination with another cyanuret; and I have already attained a certain number of very satisfactory results. I have proved that, in many liquid cyanurets, iodine is substituted for cyanogen, atom for atom; so that, by the quantity of the iodic solution employed and decolored before its reaction on the solution of starch is manifested, we may calculate, with the greatest ease, and in a moment, the quantity of cyanogen contained in the liquid, and the quantity of metal with which it is combined.

I have been able, by this means, with precision, to analyse the cyanuret of potassium; and it would doubtless be the same with other alkaline cyanurets. It is the same with cyanuret of mercury; the same also with the double cyanuret of potassium and silver, which contains 8 atoms of cyanogen to one of silver—that is to say, 3 atoms of cyanuret of potassium combined with 1 atom of cyanuret of silver; the same also with cyanuret of silver dissolved in yellow protocyanuret of potassium and iron; the same with the cyanuret of potassium and copper; and the same with the cyanuret of gold dissolved in cyanuret of potassium, &c. The analysis of the cyanuret of gold is not so easy as that of the abovementioned cyanurets, and requires rather more care. Things also occur in another manner: while 8 atoms of cyanogen are necessary for dissolving 1 atom of gold, four atoms combined with the gold and 4 with the potassium, 4 atoms of iodine are sufficient for producing the decomposition. This appeared to me to be owing to the cyanuret of gold not being attacked by the iodine, and being entirely precipitated only when the iodine has decomposed all the cyanuret of potassium. The cyanuret of potassium and iron is too powerfully combined to be separated by iodine.

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[*] *Comptes Rendus*, No. 1, Jan. 2, 1843.

I thought that, by this means, the quantity of metal contained in other combinations might likewise be determined; and some experiments have already led me to believe that it is possible thus to appreciate the quantity of silver in the neutral nitrate of silver, that of mercury in the nitrate of protoxide of mercury, &c.

However, on these different points I can give only indications. When I have multiplied my researches, and collected a greater number of facts, I will present to the Academy a complete work on these questions.

In a former communication, I advanced that the iodic solution could not be applied to the analysis of waters containing at the same time a sulphuret a hyposulphuret and a hyposulphite, because iodine did not act with respect to the hyposulphites as with respect to the sulphurets. This assertion has since been contradicted by M. Henry, who affirms that the sulphites and the hyposulphites act with the iodic solution like the hydrosulphates and hydrosulphuric acid. This is true as regards the sulphites, of which I did not speak; but it is quite wrong with relation to the hyposulphites. Indeed, while 1 centigramme of sulphur in the state of sulphuret decolors and absorbs, if I may so speak, nearly 8 centigrammes of iodine in solution, 1 centigramme of sulphur in the state of hyposulphite absorbs only about 2 centigrammes of iodine, or 21 milligrammes; that is to say, that the quantity of iodine absorbed in the second case is to the quantity absorbed in the first case, as 2 to 7½. The difference is evidently enormous, and, indeed, results from two very different modes of acting. The quantity of iodine absorbed by a hyposulphite is scarcely half that which would be necessary for saturating half of the base; I say *scarcely*, because, in calculating according to the atomic weights, I have not arrived at a perfect correspondence, and some experiments are necessary on this point. With respect to the result of this mixture, I have remarked the following: hyposulphurous acid is not decomposed; it appears to me to combine with the iodine, or simply to dissolve it. However, it also seemed to form a little sulphuric acid by the action of the iodine, but I have not found the quantity of this acid correspond with that of the hydriodic acid, which would be formed by the iodine absorbed. Be it as it may, it results from this fact, as I have already stated, that the sulph-hydrometer cannot be sufficient for the analysis of a combination of a sulphuret and a hyposulphite. It is useful, however, in such a case, but must be joined with other means of analysis.

The sulphites absorb exactly the same quantity of iodine as the sulphurets, the quantity of sulphur being equal; and this proportion of iodine is precisely that which would be necessary for converting all the sulphite into sulphate, by the decomposition of water, whose hydrogen forms with the iodine hydriodic acid. But it seems that a portion of the oxygen produced escapes combination, for the quantity of sulphuric acid is always rather less than it should be, on account of the sulphite which exists in the solution.

Moreover, I do not think that there is any occasion to be pre-occupied with the simultaneous presence of a sulphuret and a sulphite in a mineral water, while, as I have proved by numerous experiments, the presence of a sulphite in a solution of sulphuret rapidly converts the sulphuret into hyposulphite, without the sulphite itself undergoing a similar transformation. I have thus seen 10 centigrammes of sulphur in the state of sulphite convert into hyposulphite 20 centigrammes of sulphur in the state of quintisulphuret.

The process of analysis, which I have pointed out, may undergo a very important simplification, for, instead of employing at the same time the red cyanuret of potassium and iron, and another salt, as bichloride of iron, it is sufficient to pour into the mineral water to be analysed a few drops of red cyanuret, and then a solution of chlorine sufficiently in excess to make all the sulphur pass to the state of sulphuric acid, whether it was previously in the state of sulphuret, sulphite, hyposulphite, hydrosulphuric acid gas, or even of hydrated sulphur. This quantity of sulphur being known, it will be easy afterwards to determine its different states.

DESCRIPTION OF ARSENIO-SIDERITE, A NEW SPECIES OF ARSENIATE OF IRON.*

BY M. DUFRENOY.

M. Lacroix, pharmacien, of Mâcon, sent me, some months ago, some samples of a fibrous substance, of a yellowish brown, found in the manganese mine of Romanèche, near Mâcon.

The fibrous nature of this substance, together with the locality in which it was found, had given rise to the supposition that it was hydrated peroxide of manganese, the color of which is somewhat analogous to that of the samples of Romanèche.

The analysis which I made did not confirm this supposition; it showed that the substance contained arsenic acid, peroxide of iron, and lime, and that it was a double arseniate which constituted a new species, very different in its composition and characters from the arseniates already known.

The proportions of its elements are—

		Oxygen.	Proportions.
Arsenic acid	34·26	11.89	5
Oxide of iron	41·31	12·66	6
Oxide of manganese	1·29	0·39	
Lime	8·43	2·36	1
Silica	4·04	2·10	1
Potassa	0·76		
Water	8·75	7·99	3

which may be represented by the formula, $3F^2 Ar + C Ar^2 + 3Aq \ldots\ldots + S$.

In this formula, I have considered the gelatinous silica as foreign to the mineral. The analysis of the calcareous formation of Champigny, near Paris, which contains as much as 10 per cent. of silica soluble in the acids, without the mixture of the smallest proportion of alumina—that of the green freestone of Vouziers, given by M. Sauvage, in his important work on the Geology of the Ardennes, who informs us that this rock contains 56 of silica soluble in a ley of caustic potassa—prove with certainty that the gelatinous silica is mechanically mixed with minerals whose clearly defined proportions cannot admit silica into combination. Silica is, therefore, frequently found in solution in the same waters which deposit carbonate of lime; we think that it has been the same with the substance of Romanèche, which is presented with all the characters of a concretion, and that the gelatinous silica in it was likewise in the state of mixture.

Arsenic and iron being the two elements of this new substance, I have given it the name of *arsenio-siderite*, which indicates them both.

Arsenio-siderite forms fibrous concrete masses, adhering to the surface of the tubercles of the manganese.

Its fibres, which are large and distinct, may be separated like those of hard asbestos. Arsenio-siderite is soft, and may easily be crushed by pressure between the fingers. Its color is yellowish-brown, which becomes deeper by exposure to the air. Very fusible before the blow-pipe, it gives the reactions of arsenic and those of the oxide of iron.

Its sp. gr. is 3·52.

CHEMICAL COMPOSITION OF THE FLUID OF RANULA.*

BY L. GMELIN.

It is quite different from saliva, contains no sulphocyanate, only a small proportion of salivin, but principally albumen. The albumen amounts, however, to but 2 per cent., although the fluid is of as thick consistence as others which contain 5 per cent. Hence, it is supposed that it contains some peculiar matter to which its thickness is due, or that the albumen is of a peculiar nature.

ANALYSIS OF A CALCULUS REMOVED FROM THE LACHRYMAL CANAL.

BY M. BOUCHARDAT.

This calculus was extracted from the lachrymal canal of a lady, æt. 66, who had always enjoyed good health, with the exception of a few slight attacks of gout, which left some small concretions on the finger and toe joints.

The calculus weighed $\frac{4}{10}$ of a grain, and yielded on analysis:—

Solid albuminous substance	25
Mucous matter	18
Fat	a trace
Carbonate of lime	48
Phosphate of lime and magnesia	9
Chloride of sodium	a trace
	100

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* *Comptes Rendus*, No. 1, Jan. 2, 1843.

* *Repertorium für gesammte Medecin.*

CHEMICAL EXAMINATION OF THE ROOT OF ONONIS SPINOSA.

BY R. REINSCH.

1000 parts of this root furnished:—

Gum	0·042
Vegetable albumen . . .	0·010
Lime, magnesia, and potassa, combined with a vegetable acid .	0·020
Starch	0·124
Bitter substance, precipitable by tannic acid	0·008
Sweet and bitter substance precipitable by sulphuric acid (ononid)	0·012
Essential oil	indeterminable
Fat oil with ossalescent matter .	0·009
Resin soluble in ether . .	0·008
Substance resembling wax, insoluble in cold ether . .	0·002
Brittle resin, soluble in cold alcohol	0·013
Substance soluble in boiling alcohol, crystallising in needles (ononin)	0·007
Amylaceous substance, soluble in liquor potassæ . . .	0·178
Fibres	0.442
Water	0·120
	0·995

EXAMINATION OF THE PECULIAR SWEET AND BITTER SUBSTANCE.

In order to be better able to study this substance of the ononis and to make a more accurate quantitative determination of it, Reinsch poured cold water on 2000 gr. of roots cut in small pieces, and heated it to boiling. The decoction was repeated until the root appeared exhausted. The decoction was very clear after standing 12 hours; it was mixed with sulphuric acid, previously diluted with twice its weight of water, until it was no longer turbid, and was then left for some days to settle. During this time, the precipitate was deposited partly under the form of a light brown powder; but it was also partly suspended in the liquor and could not be separated by filtration, because it also passed through the filter; it was only at the end of 10 or 12 days that the greater part was deposited. The combination of the substance of the ononis with sulphuric acid was dissolved in alcohol, neutralised by carbonate of potassa, and separated by the filter from the saline precipitate as well as from a little vegetable albumen precipitated at the same time. The alcoholic solution is not rendered turbid by water, although the substance is very soluble in alcohol. Sulphuric acid precipitates it *de novo* without alteration from the solution mixed with water. If the solution be evaporated and left to settle, the pure substance is deposited in brown-yellow, transparent, gelatinous masses. Thus prepared, it has a neutral reaction, although it is probably acid; for the reaction of the alcoholic solution is always acid. It has at first a very bitter taste; but this taste changes in a few minutes to a sweet taste, which frequently lasts an hour and excites a continual salivation. If the substance thus prepared be dissolved in water, a white granular powder is separated, which is the waxy substance. The solution of the substance, which may then be regarded as pure, formed a white precipitate with sulphuric acid. It gave with acetate of lead a white flocculent precipitate; with protonitrate of mercury, a dirty-white precipitate; with nitrate of silver, a greyish precipitate; with acetate of copper, a blue-green precipitate; with bichromate of potassa, a yellowish white precipitate. No reaction with the solution of emetic, and the tincture of nutgalls.

Sulphate of ononid is viscid, of a light brown, but gradually dries into a brittle red-brown transparent mass, which has an astringent taste with a sweetish after-taste. This compound is only sparingly soluble in even boiling water.

If the solution of the pure substance be evaporated to dryness, there remains a transparent brittle substance of a deep yellow; heated in a platinum spoon it fuses, gives off acid vapors, swells up considerably, burns with a very smoky flame, and leaves a bulky carbonaceous matter difficult of combustion.

These properties sufficiently prove that this substance of the ononis is completely analogous to glycyrrhizin, from which it is distinguished only by the bitter taste which it at first presents. The author has proposed to give the termination of *id* derived from acid (*ononid*), in order not to confound it with an immediate proximate principle of vegetables, whose name terminates in *in*. It also appears to him that it would be more proper likewise to name glycyrrhizin, which, like ononid, resembles the acids, *glycyrrhizid*.

POTASH AND LIME IN FLINT.*

BY BARON BERZELIUS.

It is known from Klaproth's analysis, that flint contains lime; but Berzelius has also found potassa in the flint of the chalk of Limhamn, in Schonen. In 1000 parts of flint, he detected 1·17 parts of potassa, and

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* Berzelius *Jahres-Bericht*; as given in Professor Jameson's *Edinburgh New Philosophical Journal*, Jan. 1843.

1·13 parts of lime, with traces of oxide of iron, and likewise a small quantity of a carbonaceous matter, which left no residue on being ignited, and which probably produces the color in flint resembling the tint of dingy yellow topaz.

The analysis was undertaken with the view of ascertaining the cause of the decomposition of the surface of a flint knife, a change not unfrequently observed in flint exposed to the action of the atmosphere. The result obtained was, that the interior and undecomposed portion of this knife contained in 1000 parts, 1·34 potassa, 5·74 lime, and 1·2 oxide of iron and alumina. The decomposed portion, on the other hand, which could easily be rubbed off in the state of powder, contained in 1000 parts, 3·2 parts of potassa and 3·2 parts of lime; whence it would seem that the decomposition had its origin in a long continued action of a liquid containing potassa, which gradually replaced the lime by potassa. The decomposition proceeded progressively, so that it had already evidently commenced in the still coherent portion of the flint, and had formed a white stripe round the mass, having a breadth of 0·3 to 0·4 decimal lines.

SULPHURIC AND MOLYBDIC ACIDS.*

Dr. Thomas Anderson, of Leith, has lately made some experiments on the relations of these two acids. The molybdic acid dissolves in the sulphuric, but the combination cannot be made to crystallise by evaporation. However, on decomposing molybdate of baryta, with an excess of sulphuric acid, and evaporating the solution over sulphuric acid, a crystallised compound is obtained, which, according to the analysis of Anderson, consists of sulphuric acid 57·3, molybdic acid 32·8, water and loss 9·9. Two isomeric modifications seem to be indicated.

PLATINA IN THE AURIFEROUS SAND OF THE RHINE.†

Döbereiner has detected a small quantity of platina in the auriferous sand of the Rhine. The amount was only 0·4 of a grain in 2 ounces.

CONVERSION OF CINNAMIC INTO HIPPURIC ACID IN THE ANIMAL ORGANISM.‡

BY O. L. ERDMANN AND R. F. MARCHAND.

The conversion of benzoïc acid into hippuric acid in our organism, which has been placed beyond doubt by Ure and Keller (see The Chemist, Vol. III. p. 379), led Erdmann and Marchand to ascertain how cinnamic acid, which, in many respects, presents so much resemblance to benzoïc acid, would act in the same circumstances.

Six persons took, before retiring to rest, about 5 or 6 grammes of pure cinnamic acid, mixed with simple syrup. The urine first passed on the next morning was evaporated, hydrochloric acid was added, which immediately determined an abundant precipitate of a white substance, with a slight brownish tinge, and in small needles. These crystals were submitted to ebullition with animal charcoal, and the water of the solution, which was at first brown, then became colorless. The urinary odor, which they still presented, was removed by treatment with a little chloride of lime and a new separation of the acid by hydrochloric acid.

The acid, which was of snowy whiteness and crystallised in long prisms, had completely the aspect of hippuric acid. It presented, during fusion, the same reaction as the latter; it gave a distilled liquid, of a red color, which had the odor of oil of bitter almonds, and it sublimed a crystalline mass, which greatly resembled benzoate of ammonia. To dissipate all doubts, this acid was analysed after having been dried *in vacuo* over sulphuric acid. It gave per cent. 59·82 C., 5·01 H., and 7·92 N.

Now, this is the composition of hippuric acid. This acid is formed of:—

C^{18} =	1350·0	60·34
H^{18} =	112·5	5·03
N^{2} =	175·0	7·82
O^{6} =	600·0	26·81
	2237·5	100·00

There is nothing surprising, say the authors, in the production, by this way, of hippuric acid. We see cinnamic acid transformed in so many different ways, into compounds of the benzoïl series, and so often metamorphosed into oil of bitter almonds and benzoïc acid, that by regarding cinnamic acid as a substance containing benzamide, it is no longer difficult to explain the phenomenon with cinnamic acid as with benzoïc acid itself.

It is by a simple oxidation of a portion of its carbon and its hydrogen that cinnamic acid, $C^{18} H^{16} O^{4}$, gives rise to benzoïc acid, $C^{14} H^{12} O^{4}$.

The comparison of the composition of hippuric acid and of cinnamic acid may, however, lead to a very simple relation between the two substances.

The composition of cinnamide is $C^{18} H^{18} N^{2} O^{2}$;

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* Berzelius' *Jahres-Bericht*, 1842; from *Edin. New Phil. Journal*, Jan. 1843.

† *Edin. New Phil. Journal*, Jan. 1843.

‡ *Journal für Praktische Chemie.*

1 at. anhydrous cinnamic acid	C^{18}	H^{14}	O^{3}	
1 ,, ammonia		H^{6}		N^{2}
	C^{18}	H^{20}	O^{3}	N^{2}
Minus 1 at. water		H^{2}	O	
1 at. cinnamide	C^{18}	H^{18}	O^{2}	N^{2}

Hippuric acid would then be represented by cinnamide + 4 at. oxygen.

ON THE FORMATION AND COMPOSITION OF SESQUICARBONATE OF SODA.*

BY HERMANN.

THE former opinion, that the sesquicarbonate of soda is formed by the ebullition of solutions of bicarbonate of soda, which should then allow half an equivalent of carbonic acid to be disengaged, has already been refuted by Rose. That chemist has found that the solutions of bicarbonate of soda completely disengage their second atom of carbonic acid by exposure *in vacuo*, or by long boiling. He has not succeeded in obtaining crystals of sesquicarbonate of soda with solutions composed of equal atoms of bicarbonate and simple carbonate of that base.

The conditions in which the sesquicarbonate of soda is formed were hitherto unknown. Hermann thinks he has found them. This salt is not produced by crystallisation in aqueous solutions; it is then decomposed into bicarbonate and carbonate of soda, which crystallise separately; but it is very easily formed, according to this chemist, by efflorescence.

If, then, we promptly combine by the boiling, concentrated solutions of bicarbonate of soda, and if we thus prevent the second atom of carbonic acid from being completely disengaged; if we fuse together equal atoms of bicarbonate and simple crystallised carbonate of soda, in the water of crystallisation of the latter, and if the mass be dried; finally, if bicarbonate of soda be heated to a temperature not exceeding 200° C., saline masses are obtained, which consist chiefly of sesquicarbonate of soda. To obtain them in the crystallised state, it is sufficient to expose them for some time to the action of damp air, especially in cellars. If they are examined at the expiration of a few weeks, it is found that they have assumed, by absorption of water, a perfectly crystalline appearance.

The quantitative analysis of this salt has demonstrated that the present formula $(So\,O^{2}.\ 3C\,O^{2}+4H\,O)$, is not quite correct, but that its composition corresponds to the formula $So\,O^{2},\ 3C\,O^{2}+3H\,O$.

100 parts gave :—

Soda	40·00
Carbonic acid . . .	43·06
Water	16·94
	100·00

Which gives—

			Calculated in 100 parts.
2 at. soda	=	781·8	40·12
3 ,, carbonic acid	=	829·2	42·56
3 ,, water	=	337·4	17·32
1 ,, crystallised sesquicarbonate of soda	=	1948·4	100·00

Heated to redness over a spirit lamp, sesquicarbonate of soda leaves, the same as the bicarbonates of potassa and soda, a portion of carbonate. It partakes, then, with these bicarbonates, the peculiarity of allowing the excess of carbonic acid to be more completely disengaged by the ebullition of its solutions, than by the calcination of the dry salt.

XENOLITE.

THIS new mineral is so named from its not belonging to the locality where it is found. It occurs along with Wörthite, near Peterkoff, in boulders, which are probably derived from Finland. It is crystallised in prisms, united in very delicate fibrous masses. On being separated, the fibres are found to be three-sided prisms, in which two of the sides form an angle of 45° 38′, and the third seems to be at right angles to one of the others. There is a terminal plane. Hardness = that of quartz. Sp. gr. 3·58. It is colorless, but occasionally presents greyish or yellowish portions. Translucent. Fracture uneven, granular. Lustre vitreous; and on the more distinct cleavages, pearly. Gives no water before the blow-pipe. Infusible in fragments and in powder. Fusible with difficulty, with borax and phosphate of soda. According to analysis by M. Kemouen, this mineral consists of silica 47·44, and alumina (with a little oxide of iron) 52·54 = 99·98. —(*Poggendorf's Annal.* 1842, No. 8; from paper by *Nordenskiöld*, in the *Act. Soc. Scient. Fennicæ*, Vol. I. p. 372.)

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* *Journal für Praktische Chemie.*

NITROGENOUS NUTRITIVE PRINCIPLES OF PLANTS.*

BY JUSTUS LIEBIG.

Vegetable albumen, gluten, and legumen, to which vegetable fibrin might be added, are, properly speaking, the nitrogenous nutritive principles of plants. Vegetable albumen, which is distinguished by its solubility in water, is found in the juices of plants, but chiefly in oleaginous seeds. Gluten is one of the chief ingredients of the cereals. Legumen is chiefly found in the leguminous plants, as beans, peas, &c. These, with another substance, which Liebig terms vegetable fibrin, form the proper nutriment of graminivorous animals, from which their blood is produced, and from which all the nitrogenous portions of their bodies take their rise. It is in the vegetable kingdom that the nourishment of animals is in general prepared; for, strictly speaking, carnivorous animals, when they consume other animals which have fed on vegetables, consume only those vegetable principles which have served the latter as nourishment. Every nitrogenous animal substance has, consequently, its origin in plants.

In carnivorous animals, the process of nutrition is very simple; the nourishment they take is identically the same as the principal component parts of their own bodies. The flesh, blood, membranes, &c. which they consume, are in no respect different (chemically speaking) from their own flesh and blood. The food of carnivorous animals assumes a new form in the stomach and organs of digestion, but its chemical composition suffers no change; it is simply made soluble, and thus becomes transferable to the different parts of the body, taking again the form of blood, from which it originated. The vital action of these organs in digestion, and the formation of blood in this class of animals, seems to be confined to a mere change in the condition of the nutritive matter, as it is incapable of assimilation in the state in which it is taken.

The process of nutrition in graminivorous animals appears much more complicated, and the food has much less resemblance to the constituents of their bodies.

All plants which nourish graminivorous animals contain, besides the nitrogenous compounds named, certain others absolutely necessary for the support of life, which yet contain no nitrogen. These compounds are evidently applied to some particular purpose, as they disappear in the organization; they, without doubt, take a part in certain processes which in carnivorous animals are conducted in a different manner.

After a succinct theoretical investigation of the mode in which these different vegetable principles would require to yield to one another the elements of which they are composed, if one or other did not possess precisely the same composition as the animal solids or fluids, he shows by an elaborate chemical investigation that their vegetable principles undergo no chemical change in being assimilated to the animal structures. He first states the latest experiments made on the animal proximate principles, *fibrin*, *albumen*, and *caseïn*, which demonstrate that they possess exactly the same amount of elementary principles; and on comparing "the composition of nitrogenous vegetable substances with the principal component parts of animals, a most important fact is at once discovered, namely, that all those nutritive vegetable principles, whatever they may be, possess either the same composition as fibrin, albumen and caseïn, or if the percentage be different, still have the same proportion of nitrogen and carbon as the animal substances possess. It is remarkable also that this resemblance goes still farther, for these chemical substances conduct themselves in a similar manner with chemical reagents, so that we may say that their form is merely changed when animals produce blood and muscular fibre from them; for they are obtained from plants in a perfect state, so far as the proportion of their elements is concerned. Graminivorous animals are fed on vegetable albumen, fibrin, and caseïn, which have, therefore, chemically considered, the same composition, and, in most cases, the same properties as their own blood, albumen, and muscular fibre."

We must refer to the paper itself for the lengthened and numerous chemical details regarding the identity of these vegetable principles with those of the animal body, and merely state that he proves, both from their chemical reactions and from the ultimate analysis, their identity. We copy one analysis of each of these vegetable substances to contrast with those of the animal principles:

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* *Edin. Med. and Surg. Journal*, July, 1842; from *Annalen der Chemie und Pharm.* Aug. 1841.

VEGETABLE PRINCIPLES.

	Fibrin.	Albumen.	Caseïn.	Gluten.
Carbon	54·603	54·74	54·138	55·22
Nitrogen	15·810	15·85	15·672	15·98
Hydrogen	7·491	7·77	7·156	7·42
Oxygen Sulphur Phosphorus	22·096	21·64	23·034	21·38

ANIMAL PRINCIPLES.

	Fibrin.	Albumen.	Caseïn.
Carbon	54·56	54·48	54·96
Nitrogen	15·72	15·70	15·80
Hydrogen	6·90	7·01	7·15
Oxygen Sulphur Phosphorus	22·82	22·81	22·09

From the facts which he states, Liebig draws many interesting physiological conclusions, some of which are speculative, others founded on facts; and mentions it as a remarkable fact, that even the inorganic ingredients are the same in both the animal and vegetable kingdoms.—When burnt, both leave similar ashes.

"Animals," says Liebig, "are distinguished from plants from their capability of moving from place to place, by their sensations and sensibility, or, in one word, by their senses; for all these purposes certain organs are required which are entirely wanting in plants. The same active principle, however, gives to the bud, the leaves, and the fibres of the root, the same wonderful properties. The plant is alive as truly as any part of the living animal body. They both receive, on the same principle, the properties of growth, reproduction, and the power of replacing in the system that which has been consumed. Of these properties vegetable life consists; it is developed without consciousness.

"Chemically speaking, animal life, though of an infinitely higher rank, generates only the substance of the nerves and of the brain, which are altogether wanting in plants. Although animals receive from vegetables all the ingredients requisite for the formation of blood, and cannot by their own organisation generate from them carbonic acid and ammonia as plants do, the power belongs to them alone of producing those bodies of a higher order, such as the complex constituents of the brain, the spinal marrow, and the nerves. Animals must have peculiar organs for the exercise of the will, the feelings, and locomotion; and these organs must be produced from that part to which the impulse is given. Physiology gives us no decided information on these points. The spleen and the numerous glands must all have some part to perform in the body, and a necessary one, too, or they certainly would not exist.

"The growth of plants depends on the continual supply of carbon and two other elements; and this supply is obtained by the separation of oxygen from the ingredients of their food. The growth of the organs of a graminivorous animal must depend also on a similar separation of oxygen. But we know, on the contrary, that the lives of animals are characterised by a constant absorption of oxygen, although it does not remain in the body; and it is known, from a number of simple facts, that, besides the oxygen of the atmosphere, which escapes in combination with carbon, another portion arising from the food must escape also, under certain circumstances, as carbonic acid. This last oxygen arises from nutriment, which contains no nitrogen, when fat is formed. Starch, sugar, and gum, cannot be used by animals for the formation of blood or muscular fibres, because the nitrogenous nourishment they receive contains all that is wanted. The membranes, the cellular tissue, skin, horn, and the claws of animals, contain more nitrogen in proportion to their carbon, than albumen and fibrin. These latter (albumen and fibrin) must give up a certain portion of their carbon, if the former (cellular tissue, &c.) are formed from the blood; that they are produced from substances with no nitrogen is impossible.

"Now we find that the flesh of graminivorous animals, and especially of domestic animals, which eat a great deal of food without nitrogen, is very fat, and that this fat may be increased by increasing the supply of this kind of food. The flesh of carnivorous animals is without fat, and sinewy: all the food which they eat contains nitrogen, except the fat of the animals they devour.

"It is evident that starch, sugar, and gum are incapable of supplying that loss which is continually occasioned in animals by the vital powers; they are incapable of forming muscular fibre, cerebral matter, the membranes, or the bones and sinews, because their only elements are carbon, and the elements of water. Children fed on such food become very fat, but neither their muscles nor their bones can increase, and they themselves, therefore, cannot become stronger."

Liebig then gives the chemical analysis of the fat of the pig, of sheep, and of man, and shows that it contains the same proportions of carbon and hydrogen as exists in amylin, sugar, and gum, so that, merely by giving up part of the oxygen, these vegetable principles may become fat—"the only substance which contains no nitrogen in the animal organisation."

The fat, says Liebig, must have some use, and he inquires whether a certain portion of food without fat is absolutely necessary to the existence of the life of animals merely for the sake of forming fat. Wild graminivorous animals have no fat, but more muscle than carnivorous; they become fat before the breeding seasons, or before hybernation, when they take nourishment. This inquiry he sums up in the following terms:—

"Man and every animal are exposed at every period of their lives to the unceasing and destructive action of the atmosphere; with every breath he draws out a part of his body; every moment of his life he produces carbonic acid, the carbon of which his food must replace.

"If we observe a man or other animal in sickness, or at any time when the body is not supplied with nourishment to compensate for the continual loss, we find him to become lean; the fat is the first to disappear; it vanishes through the skin and lungs in the form of carbonic acid and water, as none of it can be found in the fæces and urine. Fat resists the action of the atmosphere on the body, and is a protection to the organs. But the action of the atmosphere does not end with the loss of the fat. Every soluble substance in the body gives up its carbon, until at length all resistance ceases, and death and decay begin, when every part of the body enters into combination with the oxygen of the air. The influence of the atmosphere is the cause of death in most chronic diseases; from want of carbon to resist its action, that of the brain and nerves is used. In a normal state of health and nutrition, however, the carbon of the carbonic acid must have another source." And Liebig concludes this most interesting paper by promising another, in which he will "endeavor to show that the carbon of such substances as sugar, gum, and starch, is used for the purposes of respiration and the production of animal heat; and that the latter is closely connected with the carbon of the food."

NEW SULPHURET OF BISMUTH.*

BY DR. WERTHER.

We at present know, with accuracy, only one combination of sulphur with bismuth, which corresponds with the oxide. It exists crystallised in the mineral kingdom, and H. Rose and Wehrle found its composition to be 81·5° per cent. of bismuth, and 18·5 per cent. of sulphur, and the artificial sulphuret of bismuth, obtained by fusing sulphur with bismuth, is regarded as identical with this compound. Berzelius, it is true, in his treatise on the use of the blow-pipe, makes mention of a natural sulphuret of bismuth which does not give sulphur by heat, and which may, consequently, be considered as an inferior degree of sulphuration; but no analysis of this sulphuret is in existence; Berzelius himself does not speak of it in his Treatise on Chemistry.

By adding 1250 grammes of bismuth to 375 of sulphur in fusion, fusing the mixture three times with a fresh addition of sulphur, Werther obtained a mass of a perfectly radiated texture, and completely possessing the character of a chemical combination. This mass, rapidly cooled, presented internally a fine group of well-formed crystals. It gave by analysis, as well as the crystals, the following composition:—

I.	II.
86·203 bismuth.	86·340 bismuth.
13·813 sulphur.	13·502 sulphur.

If the old atomic weight 1330·3 were re-established, instead of the new one 886·92, this combination would be found to contain 1 at. of sulphur to 1 at. of metal, while the natural sulphuret (*Wismuthglanz*) is formed of 2 atoms of metal and 3 at. of sulphur. It should be composed per cent., according to calculation, of—

86·865 bismuth.
13·135 sulphur.
———
100·000

There exist, then, two compounds of bismuth with sulphur:—

Natural sulphuret of bismuth (*Wismuthglanz*) = $\overset{,,,}{\mathrm{Bi}}$
(sesquisulphuret of bismuth),

Simple sulphuret of bismuth = $\overset{,}{\mathrm{Bi}}$
(sulphuret of bismuth).

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* *Journal für Praktische Chemie.*

The following are the physical and chemical characters which distinguish simple sulphuret of bismuth from the natural sulphuret.

1. The lustre of the radiated crystalline mass, as well as of the crystals, is not of a deep lead grey like the natural sulphuret, but of a metallic and very brilliant white grey.

2. The mean of five experiments gave, as its specific gravity, 7·29, while that of the natural sulphuret is from 6·1—6·5.

3. The crystalline form is a regular tetrahedral prism with obtuse lateral angles. The crystals are very fine and very long, when large masses are fused; but they have very polished and very brilliant surfaces; they are well formed and easily recognisable.

4. It acts before the blow-pipe like the natural sulphuret. Heated in an open glass tube, it gives rise to a disengagement of sulphurous acid: the compound fuses, and does not sublime sulphur. In a glass tube closed at one end, and sufficiently straight for the atmospheric air to be driven out before the fusion of the substance, only a very slight layer of sulphur is formed, and it also requires a very high temperature. If we compare the manners in which these two sulphurets act, in two closed glass tubes placed side by side, we perceive that the simple sulphuret fuses much more readily than the natural, and does not give rise, as has already been stated, to a sublimation of sulphur, while a considerable quantity of it is sublimed from the latter.

ANALYSIS OF THE MENSTRUAL FLUID.*

M. Bouchardat undertook a new analysis of the menstrual fluid, obtained from a female, who consented to allow a speculum to remain in her vagina for ten hours, in order that an ounce of it might be procured. Without this precaution the fluid becomes mixed with vaginal mucus and urine, as the presence of ammoniaco-magnesian phosphate proves. The following is the analysis:—Water, 90·8; fixed matters, 6·92. The fixed matters were composed of fibrin, albumen, and coloring matter, 95·27; extractive matter, 0·42; fatty matter, 2·21; salts, 5·31; mucus, 16·79. The female from whom the secretion was obtained, was a patient of M. de Boismont, and he considers the great proportion of water due to the delicacy of her frame, and her subsisting chiefly on vegetable diet. Another specimen of menstrual fluid, examined by M. Donné, gave the following microscopic characters: 1st, abundance of the ordinary globules of the blood; 2nd, vaginal mucus formed of epidermic squamæ from the mucous membrane of the vagina; 3rd, mucous globules furnished by the neck of the uterus. From these examinations it results that the menstrual fluid does not differ from arterial blood. As to the acid or alkaline nature of the fluid observed by authors, it depends upon the presence of mucus from the vagina and neck of the uterus. The mucus, as M. Nauche has proved, is acid in a healthy woman and after delivery, but becomes alkaline when it is glairous, or the product of inflammation; if only a limited portion of the passage be affected, the secretion will be acid in one part and alkaline in another.

ANALYSIS OF A FOSSIL RESIN FROM THE ENVIRONS OF BUCARAMANGA. (SOUTH AMERICA.)*

BY M. BOUSSINGAULT.

This resin has been met with in very considerable quantity, in a porphyro-auriferous alluvion worked at Giron, near Bucaramangá, province of Soccoro, which belongs to Nueva Granada.

The sample which I possess was given to me by Dr. Eloz Valenzuela, who had detached it from a block weighing nearly 12 kilogrammes.

The fossil resin of Giron is transparent and of a pale yellow; it easily fuses, and burns with a clear flame without leaving any residue.

By friction, this resin becomes powerfully electric. It is insoluble in alcohol; in ether it swells up and becomes opaque. Its density is rather greater than that of water. From its appearance and properties, the resin of Giron may be confounded with certain varieties of amber; but, in distilling it, I have not succeeded in obtaining from it succinic acid.

Analysis, made by means of oxide of copper aided by the action of a current of oxygen, gave the following results:—

0·300 gr. of resin produced 0·910 gr. of carbonic acid; 0·293 gr. of water.

Carbon	82·7
Hydrogen	10·8
Oxygen	6·5
	100·0

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* *Prov. Med. Journ.* July 30, 1842; from *Boismont on Menstruation.*

* *Annales de Chimie et de Physique*, Dec. 1842.

ON THE DISTILLED ZINC EMPLOYED IN MARSH'S APPARATUS.*

BY P. MAHIER.

In making, in the month of May, 1842, with M. Touchalaume, a judicial analysis by means of Marsh's apparatus, and using for the purpose pure distilled zinc, we found, like M. Gueranger, that it was then much less attackable by sulphuric acid diluted to $\frac{1}{7}$; it was then necessary to add acid.

Subsequent experiments have convinced me that this effect, according to my expectation, was due to a contraction of the molecules of the zinc occasioned by the sudden cooling of the metal by water during the operation of the distillation. I found that by laminating this zinc, or simply hammering it, or beating it in an iron mortar into small leaves, it acquired the same intensity or quickness of action as ordinary laminated zinc.

This means may compensate for the addition of another metal which developes electricity, as has been indicated.

COMPOSITION OF ANIMAL SUBSTANCES.†

M. Bouchardat read a Memoir to the Academy of Sciences, Paris, June 20, 1842, on the immediate composition of fibrin, gluten, albumen, and caseum. The chief conclusions derived by the author are—first, fibrin is composed of four immediate principles, in variable proportions—viz., of matter identical with pure albumen, which the author proposes to call *albuminose;* this matter is enclosed in the meshes of a tissue composed of gelatin and of a principle exactly similar in properties to the epidermis, which the author names *epidermose.* Here, then, we find in the blood two fundamental principles of animal tissues—gelatin and epidermose—the existence of which in the vital fluid was not before known.

Secondly, The basis of albumen in the egg, of serum in the blood, of gluten in vegetables, and of caseum in milk, is identical, unless we admit what is out of the question, that water scarcely reddening turnsole paper possesses sufficient chemical power to transform all these substances, at an ordinary temperature, into one and the same principle.

M. Dumas has also performed some recent experiments with the same results. His experiments, made in conjunction with M. Cahours, prove—

First, That the albumen of serum, eggs, and vegetables, is identical in composition.

Secondly, That caseum, whether taken from milk or plants, has the same composition as albumen.

Thirdly, That fibrin, derived from the blood or from plants, always contains more nitrogen and less carbon than albumen or caseum.

Fourthly, That almonds, peas, beans, &c. contain a principle something analogous to caseum, but furnish less carbon and more nitrogen than fibrin.

Finally, When fibrin has been deprived of all its soluble matter by boiling water, it deposits a residuum identical in composition with albumen and caseum; a fact well explained by the recent researches of M. Bouchardat.

UREA SECRETED IN LARGE QUANTITY BY THE PERITONEUM IN A CASE OF ASCITES.*

Professor Kane, of Dublin, has detected urea in large quantity in the fluid drawn by tapping from the abdomen of a woman affected with ascites, combined with symptoms of Bright's disease of the kidneys.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

IMPROVEMENTS IN THE MANUFACTURE OF THE CARBONATES OF SODA AND POTASSA.‡

BY MR. W. THOMPSON CLOUGH.

This invention, (which was communicated to Mr. Clough by a foreigner residing abroad,) consists in obtaining the carbonates of soda and potassa of commerce, in combination with silicate of soda or potassa, and thereby rendering those carbonates more useful for bleaching; and also in facilitating the production of the crystals of carbonate of soda, by the use of silica.

The silica is added to the soda or potassa, in the process of manufacture, in such quantities as will be sufficient to saturate the caustic alkali it may contain, and convert it into silicate of potassa or soda. It is applied to the alkaline liquor in the boiling-down furnace; or, by preference, when for soda ash, or potassa of commerce, it is mixed with the salts from the boiling-down furnace, with a shovel, or other instrument, and the combined materials are thrown into the finishing or carbonating furnace, and finished in the ordinary manner.

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* *Journal de Chimie Médicale*, Feb. 1843.

† *Prov. Med. Journ.* July 2, 1842.

‡ *The London Journal and Repertory of Arts, &c. &c.* Feb. 1843.

* *Dublin Journal of Med. Sci.*

The patentee states, in his specification, that although he does not confine himself to the exact quantities, he prefers, when making carbonate of soda, to add from 10 to 15 per cent. of silica, and for carbonate of potassa only 7 per cent.

When the carbonate of soda, prepared as above, is crystallised, the larger part of it separates in nearly pure and colorless crystals, and the resulting mother salts, from the residual liquors, retain the whole of the silicate of soda.

Where crystals of soda are not required, and only the dry carbonates of potassa or soda of commerce are wanted for the purposes of the bleacher, a similar product to that obtained from the mother waters is produced, by combining a quantity of silicate of soda or potassa, with carbonate of soda or potassa, in such proportions that the mixture shall contain 20 per cent. of silicate of soda or potassa.—*Abstract of Specification.*

IMPROVEMENTS IN THE MANUFACTURE OF SAL-AMMONIAC.*

BY MR. HENRY WATERTON.

THESE improvements consist in decomposing common salt by means of carbonate of ammonia, and thereby producing sal-ammoniac.

Two modes of effecting this are described; the first consists in making a saturated solution of common salt in water, and uniting with it a quantity of finely pulverised carbonate of ammonia, about equal in weight to the salt contained in the solution. The mixture is agitated in a close vessel for six or eight hours, and as much carbonic acid gas is infused therein as it will absorb; (but the introduction of the gas is not absolutely necessary, although the patentee prefers it); the liquid is then separated from the solid matter, by filtration and pressure. The solid matter is chiefly bicarbonate of soda, and the liquid holds in solution muriate and carbonate of ammonia and common salt, and sometimes a small portion of the bicarbonate of soda.

The liquid is now placed in a distilling vessel, and the carbonate of ammonia being distilled over into a suitable receiver, a solution of muriate of ammonia and common salt remains in the still. This solution is evaporated, by heat, to such a consistency as will cause the separation of the common salt, by crystallisation, and the salt, thus crystallised, is evaporated from the liquid by any convenient method. The liquid is then evaporated until it attains the proper specific gravity for crystallising; and it is transferred into suitable utensils for that purpose. The crystals produced by these means are nearly pure muriate of ammonia, and, when pressed and dried, may be brought to market without further preparation, or they may be sublimed into sal-ammoniac.

The other mode of manufacturing sal-ammoniac consists in taking a quantity of liquid containing ammonia, either in the caustic state or combined with carbonic, hydrosulphuric, or hydrocyanic acid, (such as gas ammoniacal liquor, or bone ammoniacal liquor,) and rectifying it, by distillation, until the distilled portion contains from 20 to 25 per cent. of carbonate of ammonia. If the liquid contains any other acids than those above mentioned, a sufficient quantity of lime is used in the distillation to decompose the ammoniacal salt.

The distilled liquid being now mixed with as large a quantity of powdered common salt as it will dissolve, is agitated for several hours, and as much carbonic acid gas is infused into it as it will absorb. The remainder of the operation is the same as before described in the first method of manufacturing sal-ammoniac. The patentee claims the use of carbonate of ammonia, in the manufacture of sal-ammoniac, by applying it to decompose common salt as herein before described.—*Abstract of Specification.*

ON MANURES AND THEIR COMPARATIVE VALUES.*

BY MM. BOUSSINGAULT AND PAYEN.

AGRICULTURISTS have long admitted that the most active manures arise from animal matters; now the principal difference between these matters and those immediately derived from vegetables, consists in the proportion of nitrogen.†

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* As given in *The London Journal and Repertory of Arts, &c.*, Feb. 1843.

* *Annales de Chimie et de Physique.*

† It may be seen, in a recent publication by M. Julien, that very old practical notions have taught the Chinese the utility of animal excrements, and of various animal remains: they also collect, with the greatest care, the urine and stercoral matters in small vessels placed for this purpose along the roads. Old men, women and children are occupied in diluting these manures and placing them near plants in proper quantities. They collect, for the same purpose, the hair from the hairdressers.

The recent progress of science not only confirms this opinion, but also enables us to reply to some objections raised against the generality of the principle; it accounts for the necessity of nitrogen for the development of plants.

The first products of the putrefaction of animal remains and even of dunghills, often the most rich in nitrogen, have lately been regarded as injurious to vegetation: hence the preference which has been given to completely decayed dunghills and to animal matters reduced into mould (*terreau*) after long alterations.*

On the other hand, admitting the carbon furnished by the carbonic acid of the air and of the manures to be the principal nourishment of plants, the utility of products capable of thus furnishing carbon, and ulmic acid in particular, has lately been appreciated. This theory, also admitted in several scientific works, had led to turf and exhausted mould (*terreau*) being regarded as excellent fertilising agents, which are, on the contrary, poor manures, at least if they be not modified by the addition of animal matter abounding in nitrogen. Finally, it was doubted whether the nitrogenous products of manures were useful from a stimulant action, or from the production of assimilable compounds.

A *concours*, opened in 1825 by the Royal and Central Society of Agriculture, effected the solution of the first part of the problem, proving that the most putrescible remains of animals may be applied as manure without any previous decay, with the sole condition of relaxing the effects of the putrefaction, and of thus proportioning the solution and the disengagement of the nitrogenous products to the growth of the plants which should absorb them.

The approbation accorded to this work, with the first prize, has since been sanctioned by a daily increasing practice of the means indicated by the author.†

With regard to the question as to the part which nitrogenous substances may perform in vegetable nutrition, it was in a great measure solved, either by the observation of a general law which assigns to all the young organs of plants, to all their parts endowed with a great activity of development, and to the substances contained in the passages of their ascending sap, an elementary composition rich in nitrogen;* or by the analytical demonstration of the quantities of nitrogen which plants imbibe from atmospheric air, in so much greater proportions as the soil has been more ameliorated by culture.†

Each of us having thus arrived, by different ways, to the same conclusions, we have been fortunate in finding in the experiments and assent of agricultural writers the confirmation of our views, and it appeared to us beneficial to combine our efforts in order to continue together, and in views of more direct applications, the work at which we had separately labored.

Before giving the results of our analysis, we will present a few general considerations, in order better to define the character and the value of these numerical data, and to explain certain apparent anomalies.

And first, it is important here to call to mind the phenomena of the nourishment of vegetables on account of the structure and physiological actions of their organs, which are accomplished by the absorption of *dissolved* or *gaseous* substances. These phenomena are thus found freed from all the complication which results in the animal nutrition from influence relative to the physical state of the aliments swallowed.

The quality and the quantity of manures applicable to plants may therefore vary within very extended limits, if they yield their gaseous or soluble products in suitable proportions, for a given time and surface. It is thus that all other things being equal, a manure entirely decomposable into its soluble and gaseous products, in the course of a single year, will be capable of producing as great an effect on the first crop as five times the quantity of another manure whose ultimate decomposition would be effected only in five years; but the latter will furnish the useful products during five times longer period, and there will be thus a compensation.

The duration of manures, often dependent on the cohesion and insolubility of the organic substance, should then be taken into serious consideration. This idea, so useful to agriculturists, also serves to show the concordance which exists between the analytical results of the laboratory and the practical effects of culture in certain cases, in which this agreement appeared doubtful.

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* At the close of the last century, Bosc, one of our learned agricultural writers, in the article *Manure*, page 70, of the great *Dictionary of Agriculture*, said, that in order to employ as manure the flesh of slaughtered animals, it was necessary to allow it to putrefy for several years: but then, it will be understood, the greater part of the nitrogenous products of the putrefaction were thus dissipated in the air.

† A permanent *concours* has, since then, every year encouraged the application of these means, which have already utilised considerable quantities of blood, muscular flesh, &c., previously wasted in France and other countries.

* *Recueil des Savants Etrangers*, Vol. VIII. page 163; Memoir on the Chemical Composition of Vegetables.

† *Annales de Chimie et de Physique*, tome LXVII. page 5, and LXIX. page 353.

It may sometimes be advantageous to modify the manures, either by hastening their decomposition, or by retarding it, in order thus better to proportion their products to the wants of the plants. We will quote a few examples worthy of attention; we will call to mind the favorable conditions which in the residues of refineries, quintuples the effects of blood and the means of disinfection which produce analogous results in their application to matters too readily putrescible.

In considering the proximate changes which the animalised matters undergo by putrefaction, we admit that, of all these matters, the most advantageous for the productions of manures are precisely those which can give rise to the largest quantity of soluble or volatilisable nitrogenous bodies. Indeed the presence alone of nitrogen in a matter of organic origin is not sufficient for characterising it as a manure; pit-coal, for example, contains very appreciable quantities of nitrogen, but pit-coal is absolutely without action on land as a manure. This is because this substance cannot undergo by the action of atmospherical agents, that putrid fermentation whose final result is a production of ammoniacal salts and other nitrogenous compounds.

The efficacy of ammoniacal salts in manures is now admitted by chemists who have paid attention to agriculture: their opinion is based on the most authentic and best established practical facts. Thus putrefied urine is, as every one knows, one of the most energetic manures; now the product of the putrefaction of urea is almost entirely carbonate of ammonia.

Guano,—that very active manure, which for ages has fertilised the arid sands of the Peruvian coasts,—is almost entirely formed of salts with an ammoniacal base.

However, in acknowledging the importance, the absolute necessity, of nitrogenous principles in manures, we are far from considering that these principles are the only ones useful in improving the soil. It is certain that various alkaline salts are indispensable to the development of vegetables.

In this respect we regard as aliments the organic and inorganic bodies, which should complete and repair by their decay the congenerous substances in living beings.

The non-nitrogenous organic principles do not, doubtless, act a passive part in the fertilizing action of manures; but, with some few exceptions, the fixed salts, water, or its elements, and carbon, superabound in the various manures; they constitute the greater part of the stubble and other remains of crops; their excess may even become injurious. The element whose proportions are the weakest is nitrogen. It is also the most rapidly dissipated by the alteration of quaternary organic bodies, an alteration which is useful for exciting the decomposition of non-nitrogenous organic substances. For all these reasons, we regard it as the principle whose presence it is especially important to ascertain; it is its proportion which establishes, in our opinion, the comparative value of manures, and their reciprocal equivalents.

Numerous practical facts have confirmed these scientific data, and the expectations to which they gave rise. It is known that the richest manures, those which now have the greatest mercantile value, and which are brought from the greatest distances, are formed of very nitrogenous substances; such are the membranes of the adipose tissues, the remains of hair, wool, silk, feathers, shavings of horn, and blood, which, dried, represent from 32 to 50 times their weight of normal dung.

Our experiments, described in this memoir, would also indicate the means of obtaining, by collecting certain injurious insects, a new kind of rich manure, whose employment would be doubly profitable to agriculturists.

Certain manures, whose strength has been correctly estimated, contain, it is true, only small proportions of nitrogenous substances, but they are almost completely free from non-nitrogenous organic remains: of this number are the organized bodies abundantly encrusted with carbonate of lime, forming immense deposits in the sea, and which, under the denomination of *merl*, are so much used by the skilful cultivators of the environs of Morlaix.

It is doubtless by supplying the loss of nitrogenous matters in the vegetable remains which are exhausted, that animal manures fertilise the land; the Flemish manure fulfils this part itself every year, and assists in producing abundant crops, without ever leaving the earth inactive. Thus, then, the manures are of so much the greater value as the proportion of nitrogenous organic substance is greater, as this proportion predominates especially over that of the non-nitrogenous organic substances, and as the decomposition of the quaternary substance is gradually operated, and follows better the progress of vegetation.

The results of the numerous analysis to which we have devoted ourselves, and whose details are given in our memoir, apply to 95 substances; they are collected in the two synoptical tables, in which also figure the elements which have served as the basis of our calculation. The first table presents the experimental data and observations, as well as the strength of the manures compared with dry or humid dung. The second table, freed from all the ciphers of observations, shows, with respect to each substance, two numbers which indicate the equivalents of manures, that is to say, the quantity by weight of each of them equivalent to 100 parts of dung; 1st, in the dry state; 2nd, in the ordinary humid state.

THEORETICAL AND PRACTICAL OBSERVATIONS RELATIVE TO THE PRINCIPAL MANURES EXAMINED.

Farm Yard Dung.

This manure, so generally employed in rural farming, costs from 60 to 75 centimes and even one franc for 100 kilogrammes; a similar dung may be obtained in town at a lower price, especially when the conveyance, effected by vehicles returning from market, costs very little; in this case it amounts from 45 to 60 centimes: every one, however, will be able, according to local circumstances, to compare the price of dung with that of each of the other manures.

It is often advantageous to employ fresh dung on more or less compact lands; for its effect is so much the greater as it has undergone less decay; besides, it improves the land by the division which it operates before it is disaggregated.* It is generally admitted, that dung disaggregated by maceration in pits, and, as much as possible, protected from the influences which favor fermentation, presents for light soils a hygroscopic substance, which improves the land, and a useful aliment for vegetation.

The farm-yard dung of which we have been speaking, and which we consider as normal manure, is a mixture of the dung of herbivorous animals and litter: before giving a few details concerning several other mixed composts, we will describe, in particular, the manures arising from the vegetable remains which most commonly enter into its composition.

Straws.

The products designated under this name vary in their qualities, not only according to the plant from which they are derived, but also according to its age at the time of gathering: in this respect the analytical data, which are perfectly in accordance with the practical observations and the facts recently admitted in vegetable physiology, prove that the straws are much the more rich in nitrogenous principles as the seeds of the plant are farther from maturity. We have operated on straw taken at the period conveniently chosen for gathering the ripe seeds, and we analysed recently cut products comparatively with old straw. Finally, we determined separately in some of them the composition of the upper and younger part; it will be remarked, that the latter is much more rich in nitrogen than the lower part nearest to the stubble.

It is known, that generally, in rural farming, a great part of the straw is used for feeding animals, that almost always also a portion is used as litter, and that the latter increases often even beyond the farmer's expectations, especially as the season advances, for the humidity which occasions mouldiness, and the dryness which hardens the straw, render it unfit to be used as food for animals.

In all cases, the straws which have not been sent away nor used for thatching buildings, are conveyed directly or indirectly to the dunghill; and it is useful to be able to compare their value in this respect.

Some, it is true, which have been threshed in the fields, and which are too ligneous to be easily applied to the nourishment of animals, or used as manure, are abandoned or burned; it would often be profitable to cause them to disaggregate by maceration in the liquids of the dunghill, and afterwards to spread them on the land: besides, their strength or richness in nitrogen may serve as a basis for the calculations of writers on agriculture. On looking over the tables, it will be remarked that, considered as manures, the kinds of straw analysed, stand thus: 1, pea straw;* 2, straw of lentils; 3, of millet; 4, of buck wheat; 5, of oats; 6, of wheat; 7, of barley; and 8, of rye. The latter, generally obtained on earths of the second class, contains less nitrogen than all the others, and is inferior in quality both as food and manure; but, fortunately, it is preferable for thatching and for other works in straw; it may also be added, that in these applications the small proportions of nitrogenous substances would be rather advantageous in rendering the straw less alterable; that, finally, straws are perceptibly richer in nitrogen when the land on which they are grown have been falsified by abundant manuring.

The husk of wheat, also called small straw, would rank immediately after the straw of lentils; it is known that this matter, in the normal state, or better still, softened by either warm water or steam, enters into the nutrition of animals, and thus indirectly augments the mass of the dunghills: it may be found necessary to apply it directly to the manuring of lands, when it is damaged.

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* The farm-yard dung, to which our examination has particularly referred, was half decayed: the straw was not entirely disaggregated; it was only softened and become filamentous.

* Which, completely dried, is equal to the dry substance of farm-yard dung.

Broom, Leaves of Madia, and Stalks of Jerusalem Artichokes.

All the stalks and leaves designated under these names present, in the order in which we have just given them, the three analysed products which besides, on account of the powerful cohesion of the stalks and the presence of a turpentine-like exudation of the madia, would require maceration previous to being used as manure.

We should here mention an important general consideration: The straws and dried stalks, of which we have just spoken, cannot be favorably compared with ordinary dung, although the equivalent of several of them in the normal state is really higher. This is owing to the predominance of non-nitrogenous vegetable tissue: this is immediately recognised in looking over the column of equivalents of the dried substance: it will there be remarked, indeed, that all, with the exception of pea-straw, are in this state much inferior to dung likewise dry. From this fact it results that, for an equal quantity of organic matter, the products of a nitrogenous or quaternary composition, being less abundant, will less hasten the decomposition, and that afterwards partly disengaged, they will leave a poorer detritus, then resembling bad manures, such as turf, ulmic acid and saw-dust (see the numbers 46, 47 and 48); the nitrogenous matter will no longer be sufficient for completing the general nutrition necessary to an abundant crop for a given surface.

Thus analysis and the most constant practical observations agree on this point, showing the utility of animalising vegetable remains containing too much liquious matter: such are the very evidently advantageous effects of the employment of herbivorous animals and of the beneficial application everywhere, without exception, of animal matters very rich in proximate nitrogenous principles.

If raw manures produce, without other addition, very good effects in agriculture, it is because the proportion of the nitrogenous substance to the surplus of organic matter in it is as great or even greater than in farm-yard dung: this may be perceived by examining the numbers of the 6th and 8th columns with regard to the leaves of carrots, to potatoes, and beet-root; in the same columns it will be seen that the leaves of heath, separated from their stalks, approach near to these manures.*

Goëmon: considered with relation to their equivalent, or in their dried substance, it is evident from the inspection of the numbers placed opposite to the *fuci*, that these *cryptogamia* approach near to, or excel dung in fertilising power: this explains the advantages of the enormous crop of *goëmon* on the shores of Britain.

These plants employed, either as taken from the sea, or half dried, macerated or even torrefied by a partial insinuation, act, by the products of their nitrogenous organic matter, and by their hygroscopic power; also, doubtless, by the stimulant properties of the saline compound, (chlorides of sodium and potassium, sulphate of potassa, &c.) which they contain.

Under the name of goëmon, the British agriculturists have employed, from the most remote periods, the different plants of the family of the algæ which they could procure; it is also used in Scotland and Ireland for manuring lands; the English call it grass-wrack or sea-weed.

Finally, it is known, that the incineration of these plants produces the mixture of salts, called soda of *warechs*, from which are extracted, especially at Cherbourg and Tourlaville, iodine and bromine, after having isolated the sulphate of potassa, the chloride of potassium and sea-salt, and after having concentrated the supernatant liquors containing the iodide and bromide of potassium.

(*To be continued.*)

[It is our intention to give the completion of this Memoir, and a second on the same subject, also published in the *Annales de Chimie et de Physique*, by the same authors. The insufficiency of our limited space when THE CHEMIST contained only two sheets, prevented us from giving the first Memoir at the time of its publication. Its value is such that it is better to give it late than never. This a striking instance, if any be wanting, of the advantages of our increased space.]

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* Simple threshing and sifting admit of this separation being effected at small cost in certain localities; it would, perhaps, be profitable to apply the leaves as manure, and the stalks to preparing an infusion of tannin proper for the preservation of skins.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ON THE USE OF THE UNRIPE FRUIT OF THE DIOSPYROS VIRGINIANA, AS A THERAPEUTIC AGENT.*

BY JOHN P. METTAUER, M.D., OF VIRGINIA.

The unripe fruit of the persimmon, so well known to every school-boy in the more temperate sections of the United States for its intense roughness, has, most remarkably, hitherto escaped the attention of practitioners of medicine as a therapeutic agent. If it has been noticed at all, the references are so brief and imperfect as to furnish nothing likely to be useful in a practical point of view.

Some years since our attention was directed to this article as a therapeutic agent, while treating several bad cases of cholera infantum in their remote stages. Well recollecting the peculiar rough taste imparted to the tongue by the green persimmon, from attempts to eat the fruit in our boyhood, it occurred to us that, as all other astringents which had been employed had failed thus far in their treatment, we would make trial of it, rather as an experiment in these cases, as they seemed to demand astringents. Our first trial consisted of the use of the simple infusion, formed by pouring a tea-cupful of boiling water upon half a dozen of the half-grown persimmons, slightly crushed. As soon as the infusion was cool, we directed a teaspoonful of it to be given to an infant rather more than a year old, sweetened with refined sugar, every second hour, until the watery discharges from the bowels under which it was rapidly wasting, should be arrested, or the infusion be found to disagree. This experiment was most satisfactory, and the result truly gratifying. The persimmon had only been administered twice before the bowels were restrained; and after the third dose it was suspended, until an alvine discharge could be procured by an enema. After this, the remedy was only administered occasionally, as the diarrhœa threatened to recur, alternating with it from time to time enemata, or mild internal aperients. In a fortnight after this agent was first administered, the child was able to run about the house, and very soon recovered perfectly.

Since the first trial with this new remedy, we have had many opportunities for using it in similar cases, and even in common diarrhœa, and the results have uniformly been decidedly favorable and salutary.

After various experiments and trials with this substance, we have adopted four standard preparations for using it; that is, the tea or infusion, the syrup, the vinous and acetous tinctures.

The infusion is a very active and efficient form, and will be found both agreeable and convenient for administration; it can only be employed, however, during the season which affords the fruit, and for this reason only, it is to be regarded, perhaps, as the least unexceptionable of the preparations of this article. Nevertheless, the infusion may be used with great advantage during the summer and autumnal months—which period of the year is most prolific of the forms of diarrhœa in which astringents are allowable. It may be prepared by infusing from one to two ounces of the fresh immature fruit slightly crushed, in a common tea-cup of boiling water, and of the cool infusion sweetened with refined sugar, from one to three teaspoonfuls may be given to infants once an hour, or after longer intervals until the restraining effect is produced. Occasionally the tea may be rendered aromatic, by adding cassia bark, pimento, ginger, and the like; or it may be animated with French brandy, gin, or wine, to render it more palatable. When to be used with adults, the dose must be augmented to from one to three tablespoonfuls, and given after the intervals already stated.

The syrup may be prepared by converting the infusion already described into a syrup, by adding to it refined sugar, and gently boiling them down to a proper consistency for keeping. This is decidedly the most convenient and useful form of using the persimmon; it is also the most agreeable, as the sugar greatly modifies the rough taste. This syrup may be variously combined for administration, and is ready at home at all seasons of the year. It also possesses the astringency of the persimmon in great purity, and will retain it for an indefinite period of time without the least deterioration.

In preparing the syrup, care should be taken not to urge the process of converting the infusion of the syrup too rapidly; gentle and gradual boiling answers best; indeed, the fluid should just be kept to the boiling point; and the process must be conducted over a sand bath or a salt-water bath; and glass vessels should invariably be used for the purpose. For infants, the doses of the syrup may be very nearly as we have advised of the infusion; perhaps they should be somewhat smaller. With adults we have invariably used from two to four tea-spoonfuls to the dose.

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* *American Journ. Med. Science*; Oct. 1842.

The vinous tincture may be prepared by digesting one pound of the green persimmon recently procured and a little crushed, in one pint and a half of port or any other wine, exposed daily to the solar heat for fourteen days. After this, the tincture may be filtered for use. This is an elegant preparation, and possesses the astringent powers of the persimmon in great purity, and in a most convenient form for administration. It is not, however, applicable to every variety of diarrhœa, by reason of the stimulating menstruum used in its preparation. This preparation is more especially applicable to the treatment of adult cases of diarrhœa, though we have occasionally employed it with infants likewise. The dose for adults is very nearly the same as advised of the syrup. With infants the dose should rarely exceed a tea-spoonful, and the medicine should always be sweetened with refined sugar.

The acetous tincture is prepared by digesting two pounds of the recent fruit a little crushed, in two pints of strong pure apple vinegar, fourteen days exposed to solar heat; the tincture may then be filtered for use. This preparation is chiefly designed for external use, especially for gargles and cataplasms. It is most valuable in tonsillary affections, especially when they follow scarlatina or chronic catarrh, used as a gargle. It is also exceedingly useful as a cataplasm in whitlow, or inflammation of the mammæ threatening milk abscess. To form it into a cataplasm, it will only be necessary to convert any quantity of the tincture into a poultice, by uniting with it when hot, the requisite proportions of any kind of farinaceous material; even the fruit may be used. We have also employed it in the early stages of dysentery after a brisk cathartic, and with decidedly beneficial effects: in this disease it promises to be eminently useful. It is a more efficient remedy in this disease than the solution of common salt in vinegar, to which, however, it assimilates itself very much in its remedial action.

The stringency of the persimmon is peculiarly adapted to the treatment of every form of diarrhœa. In the diarrhœa of infancy, we have often used the infusion and syrup with distinguished benefit. The tinctures we have also occasionally employed, but not with very decided benefit with these tender subjects; chiefly, we think, because we were unwilling to hazard their use with them in commanding doses. We have frequently united the infusion and syrup with the syrup of rhubarb and senna, or the infusion of senna; and occasionally with calomel, with benefit. With stimulants and tonics these preparations may often also be associated with advantage. In some exceedingly bad cases of protracted Mississippi diarrhœa we have used the persimmon with the most triumphant and salutary effects. In these cases we generally premise one or two doses of blue mercurial powder, about twelve grains, before commencing with the persimmon, and the syrup, or vinous tincture, given in port wine, one of the forms of using it generally adopted by us. Should the remedy restrain the bowels very suddenly, aperients must be interposed; and for this purpose, nothing answers so well as the syrup of rhubarb, or the compound syrup of senna.

Occasionally we have found it useful to combine grain portions of ipecacuanha with the persimmon, with a view to its diaphoretic effects: with adults especially, it will be found exceedingly beneficial to use such a combination.

In the chronic stage of dysentery, we have employed these forms of the persimmon very beneficially. When used in this disease, they must be united with the syrup of rhubarb or senna; or combined with the oleaginous emulsion; and, generally, paregoric in sufficient doses to impress the system decidedly, should be given with them at night.

In uterine hemorrhage, and especially in menorrhagia, we have employed the infusion, both as an internal remedy and by way of injection, per vaginam, with great benefit. In these fluxes it is destined to be eminently useful from the promptness and great potency of its action as an astringent; much, however, remains to be known of the remedial operation and applicability of the persimmon as a therapeutic agent.

Prince Edward Court House,
Va., May 28, 1842.

INDIAN CHOLERA.

In Mr. Winslow's recent work "On the Preservation of Health of Body and Mind,"* we find some interesting remarks under the head of "*Malaria.*" After adverting to the fact that many diseases of an epidemic character have been traced to an *insect* origin, he thus writes:—

"The peculiar history of the cholera epidemic, somewhat strengthens the presumption that it had an insect origin. This disease first appeared in the Delta of the Ganges, and within seventeen years spread itself round almost the circumference of the habitable globe. Hitherto no physical, chemical, or electrical condition of the atmosphere has afforded a probable solution of the phenomena of the disease. The striking feature in this singular malady was the frequent suddenness in its appearance and disappearance in given localities. No gaseous mineral or vegetable matter diffused in the air could create so strange a disorder. . . . . In many respects, indeed, the erratic and ambiguous course of the cholera is well represented by the flight, settlement, and propagation of the insect swarms, which inflict blight upon vegetable life. Their appearance at different and distant periods, without obvious cause for such irregularity—their direction to certain plants only—their settlement upon these in clusters and detached localities—the frequent suddenness of their change of place and final disappearance—are all circumstances of curious analogy; as also the curiously abrupt limitation of some of these swarms, showing itself in definite lines of direction, along which their work of destruction is earried on. These lines, though to our observation seemingly arbitrary, are doubtless connected with the instincts of life under this form, and with the relation of such instincts to the surrounding media. The cholera has been often defined in its course by similar lines of direction; sometimes stretching over considerable tracts of land or sea, more frequently obvious in particular localities; but in neither case receiving explanation from any physical conditions of the globe, from currents of air or local circumstances of soil and climate."

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* Renshaw, Strand.

These well written remarks are of course open to the various inferences of pathologists; and upon no subject could their attention be better bestowed, when we reflect on the awful mortality among our countrymen, of which we are constantly reading in the Indian newspapers. It is to be hoped that investigation will yet lead to a more certain and efficacious remedy than has hitherto been discovered. We most earnestly trust that the subject may be impressed upon the minds of those medical students whose destination is in the East India Company's service, and who will often find themselves in situations where an intimate knowledge of all the peculiarities of that dreadful infliction—the cholera—will almost give them the power of life and death over multitudes around them.

USE OF INDIAN HEMP, OR GUNJAH (CANNABIS INDICA) IN CHOLERA.*

BY W. B. O'SHAUGHNESSY, M.D.,
BENGAL ARMY.

An epidemic cholera prevailing at this period, two of the students administered the tincture of hemp in several cases of that disease, and cures were daily reported of its alleged efficacy. Dr. Goodeve was thus led to try it in several cases, and his report was in the highest degree favorable. The diarrhœa was in every instance checked, and the stimulating effects of the drug clearly manifested. The durwan of the college, an athletic Rajpoot, was attacked, and came under my treatment after he had been ill seven hours; he was pulseless, cold, and in a state of imminent danger, the characteristic evacuations streaming from him without effort. Half a grain of the hemp resin was given, and in twenty minutes the pulse returned, the skin became warm, the purging ceased, and he fell asleep. For an hour he was cataleptic, and continued so for several hours. In the morning he was perfectly well, and at his duty as usual. It is but fair to state, however, that the character of the epidemic was not at the time malignant. I admit the cases to be inconclusive, but I conceive them to be promising, and that they deserve the due attention of the practitioner.

Since this passage was written in 1838, the tincture of hemp has been used in a great number of cases, both European and native, in the hospital of the Medical College. I know no remedy equal to it as a general and steady stimulant when given to *Europeans* in half drachm doses during the tractable stages of this disease. I have known the pulse and heat return and the purging checked by a single dose. It allays vomiting much more certainly than the opium preparations, and is not more likely than these to lead to cerebral congestion on the cessation of the cholera symptoms. The cheering effect on the patient's spirits is not the least benefit this remedy confers.

In *native* cases much less advantage was obtained; nearly all this class of patients were old gunjah smokers.

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* From a valuable paper published in the *Provincial Medical Journal*, Feb. 4th, 1843.

DISCOLORATION OF THE SKIN BY NITRATE OF SILVER.*

To the Editors of the Dublin Medical Press.

GENTLEMEN,—

HAVING accidentally seen a communication in the number of the *Medical Press*, for Wednesday, August 24, 1842, from Dr. Charles Paterson, on discoloration of the skin produced by the internal exhibition of the nitrate of silver, and on the means of preventing and removing that effect, I may mention, that between three and four years ago, being engaged in a series of photographic experiments, I observed the effect of the hydriodate of potassa in discharging the color from paper, &c. which had been darkened by exposure to light, and resolved to try its effect on the human subject in cases of discoloration of the skin, produced by the too long-continued internal use of the nitrate of silver. I mentioned at the time to Dr. Abercrombie and other medical friends here, my impression that it *might* have the effect of removing this disagreeable consequence, and immediately afterwards tried its effects in a very well marked case of the description alluded to.

I first used the hydriodate of potassa, rubbed up with tinct. sapon. as an external application. This was well rubbed into the skin of the face night and morning, and the patient directed to expose himself as much as possible to the action of the solar light. It was then used in combination with the unguent. hydrarg., and afterwards in the form of a strong solution in water. It was also given internally to a considerable extent. (In this case, the internal use of nitric acid had been persevered in for some time, at a former period, by the direction of one of the professors in the University here, but without any effect.)

From the time above mentioned up to this date, the external use of the hydriodate of potassa has been continued, especially during the summer season, when the action of the sun's light is most favorable, and the internal exhibition of the medicine has been adhered to, with occasional intermissions, lest it should act injuriously upon the system.

One effect has been that the bluish leaden hue has been partially changed more to a brownish tint, and the skin has become to a certain extent lighter in color. In some parts of the face the discoloration has been materially lessened, and the natural color of the skin has in some degree become perceptible. No bad effects have resulted from the long-continued internal exhibition of the hydriod. potassæ. The unguent. iodin. of the last edition of the *Edinburgh Pharmacopœia*, and iodine combined in a still larger proportion with the hydriod. potassæ have also been used.

In this case, the discoloration has existed upwards of fourteen years.

I remain, Gentlemen,
Your most obedient servant,
HENRY GRAHAM, M.D.
11, *Shandwick Place, Edinburgh,*
January 19, 1843.

ON THE PROXIMATE PRINCIPLES OF OPIUM.*

BY MR. ROGERS.

AT a recent meeting of the Medico-Botanical Society, Mr. Rogers, the Professor of Chemistry, delivered a lecture on the proximate principles of opium. After alluding to the exceeding interest of the drug, in a physiological point of view, and the important results that have taken place in vegetable chemistry, from the discovery of its ultimate principle, morphia, he mentioned the comparative analysis of Smyrna opium by Mulder, who, after examining five specimens, gives the following as the average result of his inquiries:—narcotin, 7·713; morphia, 6·228; codeia, 0·767; narceia, 9·000; meconia, 0·790; meconic acid, 6·121; fat, 2·209; caoutchouc, 4·338; resin, 2·753; gummy extract, 25·370; gum, 1·706; mucus, 18·733; water, 12·108. Two other principles are described by chemists—the thebaïn, by Couërbe, and pseudomorphia, by Pelletier.

Narcotin is readily obtained from opium by the action of boiling ether, and is procured in crystals, as the ethereal solution cools. Other methods are occasionally adopted, but the above is the readiest mode of preparing it.

Morphia can be obtained from opium by many processes: one of the best is that proposed by Dr. Gregory and Dr. Robertson, a modification of which is adopted in the present *Pharmacopœia*. The tests for morphia in the pure state are very decisive; the following are the best:—Nitric acid, when dropped on morphia or its salts, produces a red color, which soon becomes yellow; neutral perchloride of iron produces a blue color; iodic acid, when added to morphia, is deprived of its oxygen; the free iodine can then be detected by starch. The salts of morphia are more soluble than the alkaloïd.

Codeia was discovered by Robiquet, in 1832; and Pelletier states that he obtained six ounces from one hundred pounds of

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* *Dublin Medical Press*, Wednesday, February 1st, 1843.

* *Lancet*, January 28, 1834.

Turkey opium. It differs from morphia in being more soluble in water, and by not being reddened by nitric acid, nor rendered blue by perchloride of iron.

Narceia was discovered by Pelletier, in 1832. It is obtained from opium by a very complicated process. It is, when pure, in white silky crystals, very sparingly soluble in cold water, soluble in alcohol, but not in ether. The action of acids is peculiar: when strong they decompose it, but when diluted they gradually combine with it, producing at first a blue color, which changes into purple, and then red, and finally disappears altogether. Meconia was discovered by Dublanc and Couerbe; it exists in very small proportions, and its properties require examination. Thebaïn was also discovered by Couerbe; it is described by him to possess very strong alkaline properties. Meconic acid is peculiar to opium, and forms salts with various bases. It undergoes peculiar changes by the action of heat, and produces two new acids, namely, the metameconic and pyromeconic. On the addition of the persalt, it becomes of a red color. Much has been said about the tests for opium. It is one of the few organic poisons which admit of decisive detection; for if we can obtain proof of the presence of morphia by the tests already enumerated, and the red color by the action of the persalt of iron on the meconic acid of a suspected solution, by the means recommended in several toxicological works, there cannot be a doubt of the existence of opium.

PRECAUTIONS TO BE ADOPTED IN THE EMPLOYMENT OF ALKALINE DRINKS AS LITHONTRIPTICS.*

It cannot be denied that, in certain circumstances, calculi are formed in the bladder under the influence of the continued and unmethodical administration of alkaline medicines. Must it be concluded from this, says M. Bouchardat, that bicarbonate of soda is useless, and even dangerous, in the treatment of gravel and calculus? Certainly not; but it is necessary to know how to aid this powerful means, in order that it may render all the services which we have a right to expect from it. According to this physician, the two indispensable adjuvants of all lithontriptics are: 1st, abundant aqueous drinks; 2nd, a moderate surrounding temperature. When alkalis are prescribed, it is not absolutely necessary that they should be as concentrated as they are generally ordered: 1st, because drinks so powerfully medicated are not so easily absorbed; 2nd, because a sufficient quantity cannot be swallowed every day without disgust and inconvenience. Thus, for example, the waters of Vichy contain much more alkali than is necessary, for 1 gramme of bicarbonate of soda is quite sufficient for 1 quart of water.

It is always to the bicarbonates that we should have recourse. What greater advantage, indeed, can be expected from the subcarbonates and from caustic alkalis? Evidently none; for, during the assimilation, they are converted into bicarbonates; and it is in this state that they exist in the blood. The more caustic alkalis, therefore, present the inconvenience of more powerfully attacking the digestive apparatus without ulterior advantage. When the fatigued stomach is no longer able with the same ease to bear water holding in solution bicarbonate of potassa or soda, these salts may even be replaced by citrate of soda, which, during the assimilation, is converted into bicarbonate of soda, and which, finally, has the same influence as the latter salt on the composition of the urine.

The following drink may be prescribed:—

℞ Bicarbonate of potassa	1 gramme;
Water	1 quart;
White sugar . .	50 grammes;
Tincture of vanilla	5 grammes.;

Mix and dissolve.

According to the taste of the patients, the tincture of vanilla may be substituted by tincture of cinnamon, tincture of orange, tincture of citron, &c. in the dose of 1 gramme, and the bicarbonate of potassa by bicarbonate of soda, or by a double dose of the citrate or malate of the latter base. The essential point is to give the patient a drink which will please him without fatiguing his stomach, and without causing disgust—and this is really a very difficult matter in some circumstances. The beneficial action of certain mineral waters in cases of gravel, may certainly be attributed to these waters being easily borne by the stomach, easily digested, and that a very large dose of them may be taken daily. This is the secret of the efficacy of the waters of Contrexeville. Indeed, the small proportion of iron which these springs contain, and the carbonic acid which they disengage, excite the stomach, and large quantities of the water may be daily swallowed with impunity, without fear of disorder in the exercise of the digestive functions.

As regards what is meant by large quantities of water, it is a point which may be very variable according to the individuals; but the following is a rule which M. Bouchardat indicates as a very easy guide in this respect: the urine of a healthy man becomes turbid, and deposits by cooling, when abundant aqueous drinks are not swallowed; on the contrary, it always remains limpid in the latter case, if, however, excessive perspiration does not exist. When lithontriptic drinks are made use of, the urine must be daily observed, so that it may be brought to such a state as not to deposit by cooling. When this result is arrived at, says M. Bouchardat, the gravel will disappear, and the calculi will be gradually dissolved, for there is established in the bladder a continual exchange between the bladder and the calculus. If the urine is concentrated, it deposits; if it is not saturated, it dissolves. All efforts must, therefore, be directed to maintaining it in the latter state.

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* *Journal de Chimie Médicale.*

Three or four quarts of aqueous drinks in the twenty-four hours are most commonly sufficient for attaining this end; six and more are sometimes required. But these lithontriptics are, in general, really and surely useful only when the urine remains limpid after cooling.

Drinking is not all that is required, adds M. Bouchardat, in conclusion, for obtaining abundant urine; perspiration must also be avoided. This is easily obtained by wearing a moderate amount of clothing, by carefully avoiding too rapid motions, and by rubbing the surface of the skin with a fatty body.

ON THE EMPLOYMENT OF THE PROTIODIDE OF IRON IN CONSUMPTION.*

BY M. GILBERT BOISSIERE.

M. **Boissiere** has drawn up the following paper, from observations he made on 27 cases under the care of M. Dupasquier, in the Hôtel Diuu of Lyons. This gentleman, in 1835, (*see Lond. and Edin. Month. Journal* for Sept. 1841, p. 687,) was the first who employed protiodide of iron in the treatment of phthisis. Previous to this time, a salt of iodine and iron was known, but it was always prescribed in the solid form, and used only in scrofulous tumours, chlorosis, and amenorrhœa. M. D. was the first who used this preparation in the form of a solution; and the results he obtained from it were very different from those that followed the employment of the protiodide in the solid form.

M. Boissière begins his paper by describing the physiological action of the remedy. The first symptoms appreciable after taking it are, headache, increase of pulse, bitter taste in the mouth, anorexia, and thirst. These are succeeded by nausea and vomiting, some irritation of the alimentary canal, general turgescence of the capillary system, cough, sometimes slight hæmoptysis, noise in the ears, and want of sleep.

After having described these symptoms in a lengthened manner, he proceeds to speak of its action in consumption, and to detail its effect on each particular symptom of the disease. It is unnecessary to mention each of these in succession; suffice it to say, that during the first few days of its administration, the cough becomes more frequent, and the expectoration more abundant and free; but both of these soon diminish to such a degree, that sometimes from the fourth to the fifth day of its administration, a patient, by the end of three weeks or a month, who was never free from the cough for a quarter of an hour, is not troubled with it oftener than four or five times, and occasionally not more than once or twice daily. In cases where all the signs of tubercles in a crude state were found, such as prolonged expiration, dulness on percussion, &c., these have entirely disappeared, and M. Boissière thinks it right to conclude that the disease was cured. In other patients, again, where cavities existed, the symptoms have been much ameliorated; and in two, both the pectoriloquy and rattling, which were very distinct before the medicine was taken, could no longer be detected after it had been persevered in for some time.

From all the observations he has made, M. Boissière is of opinion that the physiological and therapeutic properties of protiodide of iron resolve themselves into a tonic, astringent, and resolutive action. As a tonic, it excites all the functions, particularly those of digestion, hæmatose, and assimilation; as an astringent, it diminishes the increased secretion of the mucous membrane, and the nocturnal sweats; and as a resolutive, it stimulates the absorption of the organic products deposited in the pulmonary tissue; and he might add to these, he says, the power it possesses of favoring and hastening the cicatrisation of the cavities, if this latter were not included in the other three.

It would appear, then, that this medicine is not only innocuous, but of great utility in phthisis pulmonalis, and that there is no other remedy which can bear comparison with it.

Owing to the rapid oxidation of the protiodide of iron, it ought only to be prepared when it is required; if, however, it be necessary to keep it ready made, gum syrup is the best vehicle in which it can be preserved, as the sugar and the gum have the effect of preventing the oxidation of the iron; it ought to be kept from the air and at a moderate temperature. After gum syrup, the next best mode of administering it is in a mixture containing gaseous or distilled water.

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* *Gaz. Med. de Paris*, Dec. 24, 1842, as abridged in the *Lond. and Edin. Monthly Journal of Med. Sci.* Feb. 1843.

When decomposition has commenced, it is recognised by the liquid assuming a greenish, and then a reddish brown color; when it is kept in the gum syrup, this salt may remain for a fortnight or even more without decomposition occurring.

Every drop of the preparation employed by M. Dupasquier contains one grain of the protiodide, and the ordinary dose per day is 15 drops, increased to 120, beyond which it ought not to be pushed. When given in this quantity, it is either continued for some time, or, if any unpleasant symptoms follow, it is suspended for a week until they subside, and after their disappearance, it is to be again begun in the dose of 15 or 20 drops. In children, or very weak people, the dose may be commenced with 10 or even 5 drops a day.

M. Dupasquier employs at the same time the remedies commonly had recourse to in phthisis, and he recommends his patients to eat as much animal food as possible, and to keep themselves warmly clothed.

ON THE ABSORPTION OF IODINE.*

BY DR. LEON BROUSSE.

The numerous experiments to which M. Orfila has devoted himself, have led him to establish that the cutaneous, mucous, and serous membranes, and the cellular tissue, are capable of absorbing soluble substances with which they are put in contact. Guided by the conclusions of this celebrated toxicologist, I have been led to seek for iodine in the urine of subjects afflicted with hydrocele, to whom an iodised injection had been administered.

The following is a detail of facts:—

A Spaniard, aged about 40 years, afflicted with hydrocele, was on the 20th of May, 1842, at 9 A.M., injected with a solution made with 60 grammes of tincture of iodine to 240 grammes of distilled water. In the afternoon, I treated his urine by starch, nitric acid, and chlorine; I did not obtain any evident coloration. On the 21st, I treated in the same manner, the urine which he passed during the night, and I obtained an abundant precipitate of iodide of starch. The quantity of iodine in the urine increased until May 25, at which time a few drops were sufficient to give a very evident reaction. On the 26th the quantity of iodine began to diminish until the 20th of June, when I could recognise the existence of iodine in the urine, only by the following process:—I treated the urine by potassa, and then evaporated the liquid to carbonisation; I maintained the carbonised substance which resulted from it at a dull red heat, for 10 minutes, in a porcelain crucible; I afterwards pulverised it, and treated it by boiling distilled water, and filtered it; and then acting on a colorless liquid, by means of starch, nitric acid and chlorine, I was enabled to obtain a very evident reaction, but the coloration of the liquid, instead of being blue, was violet. I thought I should be able in this operation to dispense with treating the liquid by hydrosulphuric acid, in order to make the iodate of potassa pass to the state of iodide of potassium; for I thought that the action of the carbonised matter at a high temperature would produce this effect. On the 27th of June, the principal surgeon, seeing that the scrotum still contained much liquid, and that it did not diminish in bulk, decided on making a puncture with the lancet, and a bloody fluid escaped. Being desirous of ascertaining whether iodine existed in this liquid, I treated it by potassa as above, and obtained an evident precipitate of iodide of starch, of a blue color.

I have had numerous opportunities of examining the urine of patients who have been cured of hydrocele by iodised injections, and I have always easily found iodine in the urine, especially on the third or fourth day after the operation.

All the blue precipitates which I obtained in the preceding reactions were evidently due to iodide of starch; for, having placed them, one after the other, in a tube with peroxide of manganese and sulphuric acid, and having closed this tube with a cork furnished with a tube, containing a drop of solution of starch, under the influence of heat, I have seen this drop of starch rapidly turn blue, and furnish a precipitate of iodide of starch.

May it not be concluded from these facts—

1. That when, for the cure of hydrocele, an iodised injection is administered, a great quantity of iodine is precipitated in the tunica vaginalis by the contact of this organ; and that notwithstanding all the care which may be taken to make the injected liquid go out, there always remains a large quantity of this metalloïd in the cavity which was the seat of the hydrocele?

2. That probably this iodine, under the influence of the plastic fluid secreted by this serous membrane, passes to the state of iodic and hydriodic acids, and that it is in this state that, dissolved, it is carried into the torrent of the circulation, and thence into the urine? The existence of sodium in the state of chloride in the morbid secretion of the tunica

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* *Journal de Chimie Médicale*, Dec. 1842.

vaginalis, favors the solution of the iodine, but it seems to me to oppose this metalloïd passing to the state of iodate of soda and iodide of sodium.

3. That this conversion of iodine into iodic and hydriodic acids and its absorption must be very slow? since 38 days after the operation, I have been able to detect iodine in the liquid extracted directly from the tunica vaginalis.

4. That it is very probable that if, with a criminal intention, a solution of arsenious acid or of any other poisonous substance were injected into the tunica vaginalis, the nature of the injected poison might be detected in the urine, even if the victim did not die.

NOTE ON A BLUE URINE.*

BY M. A. BOUCHARDAT.

This urine, which was voided before Dr. Priesnitz, was sent to Dr. Schmitz, who transmitted it to M. Bouchardat. It was passed by a patient who had resided for 27 years at Surinam, and who had been during that period affected with two very obstinate intermittent fevers, accompanied by a very considerable enlargement of the spleen and liver. This patient, after having without success undergone many courses of treatment, and after having taken considerable quantities of quinine and port wine, went, in 1839, to Gräffenberg, where he was submitted, for nine months, to the hydrosudopathic treatment, without deriving much advantage from it; indeed, if the powers were restored, the swelling of the spleen and liver always appeared. In the ninth month, he had observed that the wetted compresses applied to the abdomen were stained with brown-red stains, similar to those which are produced by decoctions of quinquina. Fifteen days afterwards, he remarked, in the morning, that his urine had changed color, that it had become dark; and some hours afterwards, he found that it was perfectly blue, after which it passed successively to green, then to blackish. This phenomenon continued for about a fortnight, and, at the end of that time, the cure was completed. The patient remained 18 months at Gräffenberg, to acquire strength and to perfect his return to health: from that time, there has not been the slightest appearance of relapse, and the liver and spleen have returned to their normal size.

Dr. Schmitz has three times observed blue sediments in the urine of patients subjected to the hydrosudopathic treatment; two affected with syphilis, and an old Dane who had obstructions of the abdominal viscera. One of the two syphilitic patients had been submitted to mercurial treatment; the other had not taken mercury. In all three cases, the blue sediments were observed in the period of cure.

The same physician has observed, besides, sediments of the same color in the urinary of the establishment of Priesnitz.

To return to the urine in question: the following are the peculiarities observed in it by M. Bouchardat:—

1. It exhaled a powerful ammoniacal odor; its taste was saline; it had a deep blue color; it deposited a sediment of a fine blue.

2. Examined with the microscope, the sediment seemed to be formed of globules of excessive tenuity, of great regularity of form (which was ovoïd) and of dimensions, which may be estimated at about one third of those of the globules of human blood.

3. This urine returned the blue color of litmus paper reddened by an acid.

4. Reagents detected in it the presence of phosphates, sulphates, chlorides of lime, magnesia and ammonia.

5. The blue coloring matter partly dissolved in ether, to which it imparted a blue color; the ethereal liquids being evaporated, furnished a very slight residue of a fixed oil of a repulsive odor.

6. Alcohol partly dissolved, by aid of boiling, the coloring matter, and left a residue of a deeper color.

7. Nitric acid destroyed the coloring matter, and furnished a straw-colored liquor.

8. Sulphuric acid, diluted with twice its weight of water, did not cause any change.

9. The solution of oxalic acid dissolved the coloring matter, and a blue liquor was obtained, which, when filtered, was very limpid.

10. Ammonia did not produce any alteration in the coloring matter.

11. Potassa disengaged ammonia, and, by boiling, destroyed the coloring matter.

According to M. Bouchardat, this urine appeared to contain the saline principles of ordinary urine: as regards the coloring matter, it was quite special, and the microscopical examination as well as the action, induce the belief that it was a peculiar organic substance.

What can have been the origin of this singular matter? It is known that, under the influence of hydrochloric acid, albumen gives an intense blue color, which is not altogether unlike the product in question; but, in the economy, this acid is never found in a state of concentration sufficient for producing this conversion.

M. Bouchardat concludes by adding, that

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* *Journal des Connaissances Médicales Pratiques*, July, 1842.

he observed, twelve years ago, a blue coloring matter which bore the greatest resemblance to the sediment of this urine, and which acted in exactly the same manner with reagents; it was produced by the spontaneous alteration of gluten, kept in dry air. It may be admitted, according to that, that albuminous matters are susceptible of being spontaneously converted, in certain rare and undetermined circumstances, into organic globules of a fine blue color.

SUGAR IN THE PERSPIRATION AND SALIVA OF A DIABETIC SUBJECT.*

BY DR. NASSE, OF BONN.

The perspiration of a person laboring under diabetes, in whom transpiration had been provoked by Burdet's method, was evaporated, and the residue treated by alcohol. By heating the alcoholic solution so as to volatilise the alcohol, a viscid, syrupy and saccharine product was obtained.

The saliva of the same person also appeared to contain sugar; for, when treated by yeast, it underwent vinous fermentation.

However, it must be acknowledged, that it is not the same in all cases of diabetes; for another observer, Dr. Lehmann, by the employment of sulphate of copper and potassa, has only been able to detect the presence of sugar in the saliva of one diabetic patient in three subjects affected with this disease, and it is very probable that it was the same with regard to the perspiration. Indeed, Mr. Macgregor (*Lond. Med. Gaz.* 1837, vol. xx. p. 272,) has not been able to detect any in the latter liquid.

DECOCTION OF NUT-GALLS AS AN ANTIDOTE FOR CICUTA VIROSA, HEMLOCK.†

BY DR. MEYER, OF CREUTZBURG.

On the morning of the 19th of March, 1841, four children, of three, five, and six years of age, found in the neighborhood of the village in which they lived, some roots of *cicuta virosa*, which had been carried there by the current of a rivulet, and, having mistaken them for parsneps, they ate the greater portion of them. The child aged three years was very soon attacked with colic, vomiting, and convulsions, and died at 1 P.M., without any treatment having been resorted to.

The parents, who had learned this circumstance from the other three children who were affected in the same manner, and who had found in their hands another root of cicuta, made them drink milk in abundance, and at the same time sent for a surgeon, who immediately requested the assistance of Dr. Meyer.

On the arrival of this physician, at about 2 o'clock, the three little patients had already taken ipecacuanha, but only a few and very scanty vomitings had resulted from it. The body of each of these children was cold, the countenance pale and wan, the pupils much dilated and fixed; there were violent colics, and spasmodic motions throughout the body; two of them had entirely lost consciousness, while the third regained his senses from time to time, and complained of singing in the ears and vertigo, after which he again fell into a comatose state. The respiration, in one of the children, was feeble and scarcely perceptible; but in the other two it was irregular, stertorous, and occasionally interrupted by sighs. The motions of the heart did not present their normal regularity; they were occasionally stopped for a longer or a shorter time, then they returned in a tumultuous manner; the arterial pulsations, slow in general, presented nearly the same anomalies.

Large doses of sulphate of zinc were immediately administered to the three patients, and several vomitings, accompanied with violent shocks, very soon resulted: many pieces of the root of cicuta, softened by its stay in the stomach, were recognised in the vomited matters. The vomitings were aided and maintained by means of diluents, and by frictions of the epigastric region. At the same time glysters, to which vinegar was added, were administered, cold compresses were applied to the head, and a powerful revulsion exerted on the limbs, by means of cataplasms of mustard and horseradish. The extremities, which were of icy coldness, were rubbed with well warmed flannels, and heat was thus restored to them.

At the end of an hour, the state of stupor, the spasms and colics, began to diminish a little, in proportion as the vomiting and purging became more frequent. It should be noticed that the matter of the alvine dejections was liquid and colored yellow by bile.

A decoction of nut-galls, which had been prepared in the interval, was now administered in large and frequent doses during the first day, then in smaller and less frequent doses during the two following days. The results of this treatment were most favorable, for all the alarming symptoms gradually diminished, and, at the end of five days, the three patients were entirely recovered: from that time nothing but a simple and mild diet was prescribed for them.

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* *Journal de Chimie Médicale;* from Schmidt's *Jahrbücher*, No. 9, 1842.

† *Journal de Chimie Médicale;* from a German periodical not quoted.

The decoction of nut-galls already recommended by Drs. Phœbus and Meurer, or if preferred, the tannin, which is its active principle, in this case produced all that could be desired of an antidote. Indeed, the root, which was in all its power, contained a very strong poison, and it had been taken in great quantity, since the second root, which was less than that which had been eaten by the children, weighed 60 grammes. Moreover, the poisoning took place at 10 o'clock in the morning, a time of day at which the stomach is almost empty, because in the country it is customary to breakfast very early. Finally, the poisonous principle had had, during four hours, all the time necessary for developing its injurious effects on subjects so young and so highly sensitive to impressions.

The poisoning was very violent, as the symptoms have sufficiently shown; nevertheless, the antidote, after having been preceded by vomitings, in a short time, and in a manner at once simple and sure, caused the last traces of the symptoms of poisoning to disappear. A *post mortem* examination of the fourth child was not allowed.

POISONING OF EIGHT PEOPLE FROM EATING TAINTED BLACK PUDDING.*

BY DR. ROESER.

This kind of poisoning, so often described in German medico-legal books, has been lately observed in the family of a peasant named Ermann, residing in one of the villages of Wurtemburg. Of the eight individuals who suffered from the symptoms of poisoning, three died. The pig was killed by Ermann, who prepared the pudding himself, with the liver, spices, and other ingredients usually put in; he then boiled it in water, smoked it, and put it away in a moist cellar. It was eaten eight days after at supper. A carpenter who happened to be at supper, when eating the pudding, said that it was sour, and recommended his three assistants who were with him not to partake of it. Two of them ate each from one to two ounces, the third hardly tasted it. Ermann and a male servant, each ate plentifully of it; his two sons, of the ages of 18 and 24, also partook pretty freely, but his wife and the female servant only tasted it. The following day Ermann again ate some of the pudding. Two days after (5th of May, 1842) he complained of dryness of the mouth, giddiness, and flashes of light before his eyes. He was then seized with diarrhœa, which continued for a day, and was followed by a notable diminution of sight, general uneasiness, and *tinnitus aurium;* the dryness of the mouth increased; the pupils became dilated and immoveable; the tongue was covered with a yellow-white fur; the papillæ were red; his speech was imperfect, and his deglutition difficult; which latter did not depend on the dryness of the mouth, but on some obstruction in the œsophagus. His appetite was good, and contrasted remarkably with the state of the tongue; he had no thirst, and his breathing was easy. The next day his debility was greater; the eyelids were paralytic, and the pupils were still more dilated; his vision was gone, and the conjunctiva was of a reddish blue color; his hearing was perfect; his speech was more difficult, and seemed to depend on paralysis of the larynx, as he was able to move his tongue freely in his mouth; his intellectual faculties were entire, and he wrote on a piece of paper to his physician, requesting to be informed when all hope was gone; he was quite unable to swallow; and his pulse was feeble and intermittent. On the fourth day, the patient sank from general prostration. Half an hour before death he rose, voided his urine, and went to the water-closet, and had a stool, neither of which actions he had performed during his illness.

Post mortem examination thirty-six hours after death.—The vessels of the dura mater and brain were distended with dark-colored blood. The mouth was no longer red, but here and there were seen some injected vessels. The papillæ of the tongue were much developed. The tonsils contained several small abscesses; neither the pharynx nor larynx presented any thing anomalous, but the mucous membrane of the trachea was of a bluish color, and showed numerous ecchymosed spots, while that of the bronchi, even to the most minute division, was of a dark brown. The lungs in the upper part were empty, sematous, œdematous, filled with dark blood, and were soft and friable. The left half of the liver was flabby and of a leaden color, the right half was natural in appearance, but whene incised, gave issue to dark blood. The spleen was very large, and was full of decomposed blood. The mucous membrane of the œsophagus was not red, but bluish; that of the stomach was mixed here and there with red and black spots; the vessels were injected; the intestinal mucous coat was of a deep brown; the large intestines were filled with gas and purulent matter, and were highly vascular.

The male servant was seized with similar symptoms, and died within a few hours of his master. The *post mortem* appearances found, were similar to those described. Ermann's youngest son remained well for three days, and continued to attend school; but at last he was sent home, as he was no longer able to read the letters. His pharynx, on examination, was red, and his tongue covered with prominent papillæ. Deglutition was difficult, and his speech laborious. The disease continued to advance, but differed from the other two in being less rapid, the patient not dying until the 12th of May. At the commencement of the attack he suffered from cough and diarrhœa, which afterwards ceased. The other son was seized on the 8th of May, and presented similar morbid phenomena to the other cases, but in a less marked degree. He gradually recovered his health at the end of a month. The paralysis of the eyelids and the difficulty of deglutition were the symptoms longest in disappearing. Constipation of the bowels continued throughout; but towards the termination of the disease, cough and expectoration were troublesome. The mother, servant girl, and the carpenter's two assistants, were also affected, and were obliged to keep to bed from 25 to 30 days. They also all had similar symptoms of poisoning.

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* Würtembergishe's *Correspondenz Blatt*, Nos. 1 and 2, as given in *Lond. and Edin. Monthly Journal of Med. Sci.* Feb. 1843.

On summing up the results of these eight cases, M. Roeser remarked in all, but in different degrees, paralysis of sight, of the movements of the eye, of the tongue, of the larynx, pharynx, large intestines, and urinary bladder. The cerebral functions, and the movements depending on the spinal nerves, remained perfect. The redness which he observed during life in the mucous membrane of the mouth and pharynx, and that which was seen after death, in the trachea, bronchi, stomach, and large intestines, was not, according to him, an inflammatory redness, but a coloration depending on the stagnation and decomposition of the blood in the vessels, and giving rise in several places to its effusion into the submucous tissue.

M. Roeser regrets that he cannot mention precisely the nature of the poison contained in the pudding. He has sent a quantity of it, and of the blood of those who died, to M. Gmelin; but at the date of his publication had received no answer from that chemist.

TOXICOLOGICAL STUDIES CONCERNING THE VEGETABLE ALKALIS.*

BY A. LAROCQUE AND AD. THIBIERGE.

Professor Caventou, having some doubts concerning the results published by Dr. Christison, relative to the possibility of proving the presence of opium in certain organic liquids, and particularly in milk and beer,* has engaged us to repeat the experiments of the English chemist.

Being desirous of avoiding, as much as possible, causes of error, we wished, before repeating the experiments just mentioned, to ascertain whether the reagents ordinarily used for detecting the presence of the vegetable alkalis in general, and of morphia in particular, merited the confidence which is reposed in them. These reagents are, iodic acid, perchloride of iron, nitric acid, and also tannic acid and ammonia.

The reactions which, when pure solutions are operated on, are very decided, on the contrary become difficult, and often even impossible, to verify, when the liquids contain, besides these vegetable alkalis, extraneous matters.

Indeed, M. Merck, of Darmstadt,† in a Memoir submitted, in 1830, to the judgment of the *Société de Pharmacie*, described some experiments tending to demonstrate the difference which the vegetable alkalis present in their reaction, when they are pure, and when they are mixed with organic matters.

Thus, a mixture of animal and vegetable alimentary matters and acetate of strychnia, after having been left to itself from eight to twenty days,‡ was treated by concentrated acetic acid, the filtered liquor was evaporated

M. Merck also recovered strychnia, morphia, and brucia, which had remained from eight to twenty days in presence of animal and vegetable matters.

The following are the results which we obtained:—

We put 0·3 gr. of brucia with 200 gr. of blood: this mixture was exposed in the open air from June 2nd, to August 3rd. At the latter period, the matter was in a state of putrefaction, and exhaled a putrid odor. It was evaporated to dryness; the residue was dissolved in boiling alcohol of 85°; then this solution, filtered and evaporated to dryness, was re-dissolved in water acidulated with acetic acid. By this last operation, a liquid was obtained which was filtered and evaporated to a syrupy consistence. In this state, it was reddened by nitric acid, and acquired to dryness, then the residue of the evaporation was dissolved in alcohol, and, finally, the alcoholic solution was evaporated to the consistence of a soft extract.

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* *Journal de Chimie Médicale.*

* Orfila, *Traité de Médecine Légale*, t. III. p. 361.

† *Journal de Pharmacie*, t. XVI. p. 380.

‡ It appeared to us interesting to ascertain by experiments whether the vegetable alkalis, in contact with matters in fermentation, do not undergo decomposition. MM. Orfila and Lesueur had already made several interesting experiments, in which they had proved that acetate of morphia, by a contact of several months with matters in putrefaction, did not suffer any alteration appreciable by reagents, as regards the morphia.

This extract gave, with ammonia, a brown precipitate soluble in dilute acetic acid; this acetic solution gave, with chlorine, a white precipitate, and with hydriodate of potassa, brilliant needles. These were, indeed, the characters of strychnia; but protochloride of tin formed a gelatinous precipitate instead of the white precipitate, soluble by heat and crystallisable in long prisms; and, finally, the precipitate did not furnish with sulphuric and nitric acids the reactions peculiar to strychnia.

A similar mixture of acetate of brucia and animal and vegetable matters was submitted to the same treatment, and the residue of the evaporation of the alcoholic liquor was again treated by alcohol. This solution, evaporated to a syrupy consistence, did not precipitate brucia by contact with ammonia, and it was only by evaporating the ammoniacal liquor, redissolving in water, and treating by animal charcoal, that a precipitate could be obtained by means of ammonia; a similar mixture with acetate of morphia furnished, after having been treated in the same manner, all the reactions of morphia, except that it at first turned red by the protochloride of iron, and it was only after evaporation that it became blue.

MM. Orfila* and Lesueur also obtained a red coloration by perchloride of iron in analogous liquors containing morphia.

We have also obtained, in two instances, a red coloration in a solution arising from a putrefied liquor, in which acetate of morphia had been dissolved.

Our investigations have been principally relative to mixtures of alimentary matters and 0·2 of morphia, strychnia, or brucia, or 0·3 of the same alkaloïds combined with acids. Each of these mixtures was treated by the method indicated in a preceding note, always taking care to precipitate by acetate of lead, when colored liquids were obtained. In all these experiments, the residue of the evaporation of the acetic solution had no crystalline appearance; however, it presented with reagents the chemical characters of the alkaloïds which had been introduced into the mixture; this residue, redissolved in water, decomposed by magnesia, and redissolved in alcohol of 85°, gave no trace of crystallisation.† We had, however, here operated on mixtures which, compared with those placed at the disposal of chemists in chemico-legal investigations, contained considerable quantities of poisonous matters. The process of analysis which we employed is, in our opinion, the most simple that can be resorted to when we have rather complicated mixtures; there is no doubt, however, that by the numerous manipulations which it requires, considerable quantities of alkaloïd are lost.

The red coloration which nitric acid presents with morphia and brucia, seems to us an excellent characteristic, as it is not sensibly altered by the impurity of the liquids, and as, even in dilute solutions, the reaction is still very decided. Thus, in the experiments above detailed, the coloration by nitric acid in liquors containing morphia free or in the state of salt, is constantly shown, even

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a violet tint by the successive contact of nitric acid and protochloride of tin.

On the 2nd of June, mixtures were put in experiment, in which, to 500 gr. of distilled water, 10 of beer yeast, and 50 of sugar, we had added—1st, 0·3 of sulphate of brucia; 2nd, 0·3 of sulphate of strychnia; and 3rd, 0·3 of acetate of morphia. These several mixtures speedily entered into fermentation. After several days' contact, all disengagement of carbonic acid having ceased, we evaporated to dryness, then redissolved in alcohol of 85°, evaporated the alcoholic liquor, and treated this residue by water acidulated by acetic acid. In this liquid, evaporated to a syrupy consistence, we were able to detect the characters of the alkaloïd which had been introduced previous to fermentation.

Some red wine, holding in solution muriate of morphia, had been kept during the month of July, 1841, in an imperfectly corked bottle. On the 15th of June, 1842, the liquid exhaled a powerful odor of acetic acid; it was submitted to the above-mentioned treatment: the alcoholic liquor, decolored by animal charcoal, did not crystallise, but, evaporated to a syrupy consistence, it furnished a residue which turned red by nitric acid, and blue by perchloride of iron; it precipitated tannic acid, and reduced the chloride of gold.

From these various experiments, it results that alcoholic, acetous, and putrid fermentations do not destroy vegetable alkalis. Besides, it is already known that alcoholic fermentation does not sensibly act on the alkaloïds of opium, for it has been proposed to prepare morphia by fermentation.

* *Journal de Pharmacie,* t. XVI. p. 382.

† We may observe, however, that an infusion of tea in which muriate of morphia had been dissolved, was kept for a year; then, having been evaporated, it gave a dry and reddish-brown extract, containing muriate of morphia crystallised in white and shining plates.

when the coloration by the neutral chloride of iron is not to be depended on.

When a pure solution of morphia is put in contact with iodic acid and a solution of starch, a beautiful blue color is speedily manifested. This reduction of iodic acid is operated not only under the influence of morphia, but also by contact with animal matters. Thus, MM. Simon and Laugonné have ascertained that iodic acid may be decomposed by most neutral nitrogenous matters; indeed, by taking fresh urine, saliva, or the liquid arising from the boiling of a portion of the stomach in water, these two chemists obtained the characteristic blue coloration of iodine, as soon as they had added a little solution of starch and a few drops of a solution of iodic acid.

We have repeated the experiments of MM. Simon and Laugonné, which have perfectly succeeded; moreover, we have seen that, provided we employ iodic acid crystallised or in concentrated solution, its complete reduction is immediately obtained, if ever so small a quantity of fibrin, albumen, gluten, caseum, or beer-yeast be employed. The reduction of iodic acid is complete, for the mixture treated by water gives a liquor which, filtered, does not acquire the slightest coloration by the simultaneous action of sulphurous acid and starch. We may remark, however, that the coloration obtained by means of these reductions, does not present that fine blue, which is produced by the contact of iodine and starch; it varies more or less from violet to red, according to the nature of the nitrogenous matter. Thus, with beer-yeast, white of egg, fibrin which has been slightly altered, or water in which a portion of stomach has been boiled, the coloration is of a fine violet, whilst the contact of other nitrogenous matters causes only red or rose-colored colorations.

But if a dilute solution of iodic acid be put in contact with nitrogenous matters, no coloration is manifested, even after some hours, and, by means of sulphurous acid, the presence of iodic acid in the mixture may always be detected.

There is, however, a means of determining the decomposition of iodic acid, which consists in the employment of one of those acids which, in ordinary circumstances, do not decompose iodic acid, such as sulphuric, acetic, oxalic, tartaric and citric acids.

Thus, by mixing a dilute solution of iodic acid with beer-yeast and starch, no reaction takes place, even after some hours' contact; but if crystallisable acetic acid be poured in, the violet coloration becomes so much the more intense as more acetic acid has been employed.

It certainly is not the acetic acid which decomposes the iodic acid, for a mixture of these acids can be kept for twenty-four hours without undergoing perceptible decomposition, but as soon as yeast is added to the mixture, the iodic acid is decomposed.

These experiments succeeded well only when crystallisable acetic acid was used; if this acid be diluted with water, the reactions go on very rapidly becoming weaker in proportion to the quantities of water added, and even within a very narrow limit, all action ceases.

Concentrated sulphuric acid acts like crystallisable acetic acid; only, on account of its energetic action on organic matters, it must, as soon as the mixture is made, be very promptly diluted with water; the reaction is rapid, and the coloration violet red.

With regard to the citric, tartaric and oxalic acids, they should be employed crystallised; in proportion as they are dissolved in the mixture, they determine a very fine violet tint.

It is the same with the acids which, not being able to operate the decomposition of iodic acid under the influence of nitrogenous matters, even completely prevent that which sulphuric, acetic acids, &c. produce; such are the hydracids, and also nitric, benzoïc, and boracic acids, &c.

We at first tried the pure nitric acid of the laboratory, then pure nitric acid for which we are indebted to the kindness of M. Millon, but neither of these acids disengaged iodine; very soon all the matter was reduced into a yellow liquor.

We have dwelt on these decompositions of iodic acid, because it has appeared to us that, now that the study of ferments is occupying the attention of so many learned chemists, some interest may attach to the decompositions which ferments operate under the influence of such energetic acids as the sulphuric, acetic and oxalic.

However, as these studies were made during the months of June and July, it is possible that the high temperature which then prevailed may have favored reactions.

Be it as it may, the easy decomposition of iodic acid appears to us to demand, if not the total exclusion, at least the very prudent employment of this acid in chemico-legal investigations concerning the alkaloïds, as M. Caventou has taken care to recommend in his lectures for several years past.

In the Memoir which we have already quoted, M. Merck proposed the employment of double chloride of gold and sodium, for distinguishing morphia, brucia, strychnia, and veratria. The experiments of this chemist were repeated by a commission of the *Société de Pharmacie*, who obtained results differing but little from those which the author had announced.

In studying the reaction of the double chloride of gold and sodium, our results were similar to those obtained by the commission of the *Société de Pharmacie;* however, we have observed that when the perchloride of gold is employed, more decided reactions are obtained. The following are the results which the chloride of gold furnishes with the principal salts of the alkaloïds dissolved in water:—

Quinia	Chamois-yellow.
Cinchonine	Sulphur-yellow.
Morphia	Yellow, afterwards bluish and finally violet.*
Brucia	Coffee-colored, afterwards chocolate-brown.
Strychnia	Canary-yellow.
Veratria	Slightly greenish-yellow.

All these principles are very soluble in alcohol, insoluble in ether, and sparingly soluble in water. We doubt not that these different principles are combinations of gold, vegetable, alkali, and chlorine, for their alcoholic solution, treated by tannin, gives a greenish-blue precipitate of reduced gold; if the liquid be filtered, and if the alcohol be driven off by heat, a precipitate of tannate of the alkaloïd employed is formed. The liquor, again filtered, gives, with nitrate of silver, a white precipitate insoluble in nitric acid, soluble in ammonia.

Among the reactions of chloride of gold, there are two which appeared to us particularly important—those which it determines with morphia and brucia; they are sufficiently decided to prevent these two alkaloïds from being confounded with one another, and they also furnish good characters for distinguishing brucia from strychnia.

Moreover, we are continuing the study of the different combinations which are produced by the contact of the chloride of gold with the alkaloïds; we hope, in an early Memoir, to be able to trace their more complete history.

From these experiments on the reagents proper for detecting the presence of the vegetable alkalis, and especially that of morphia, we are convinced that nitric acid, chloride of gold and neutral perchloride of iron give the most satisfactory results. Thus, in repeating Dr. Christison's experiments, we have employed these different reagents, and tannin. With regard to the presence of meconic acid, we have been able to detect it only by the red coloration which the acid persulphate of iron gives, and by the emerald-green color furnished by sulphate of copper.

All the evaporations were made below + 100° C., and the filtrations were operated with filters washed with dilute sulphuric acid.

Dr. Christison dissolved in 125 gr. of porter or milk, 0·5 of opium.* The mixture was evaporated to dryness, the residue was redissolved in alcohol, the filtered liquor was itself evaporated, and the residue dissolved in water. The filtered liquid was submitted to the action of subacetate of lead, there was thus formed insoluble meconate of lead and acetate of morphia; then these two matters being separated by the filter, each of them was separated by sulphuretted hydrogen; afterwards, in the filtered and sufficiently concentrated liquors, the reagents were made to act.

Our experiments were made on crude opium, and also on extract of opium.

(*To be continued.*)

PREPARATION OF SOLUBLE CREAM OF TARTAR.†

BY M. CAMBORNAC.

℞ Bitartrate of potassa	400 gr.
Borate of soda	200 gr.
Tartaric acid.	11,000 gr.

I dissolve the salts and the acid together; when the solution is complete, I clarify it with white of egg, and filter. I again put it on the fire and continue the operation as directed by the Codex. The product is of a decided acid taste, very soluble, and possessed of purgative properties as active as those of ordinary cream of tartar; and is decidedly preferable to the latter.

ON NIGELLIN.‡

BY HUGO REINSCH.

The author has given this name to a peculiar matter which he extracted from the seeds of the *Nigella sativa.*

Nigelline is obtained by digesting the seeds of the nigella in alcohol at 80°, and by distilling the solution; two very oily liquids are separated, one lighter and the other of a reddish-brown. The latter, separated by filtration, is treated by ether, and afterwards by water, which dissolves the nigellin with a little coloring matter. This latter is separated by subacetate of lead, and after having filtered it, a stream of hydrosulphuric acid gas is passed into the liquid. By the evaporation of the filtered solution, nigellin is obtained, and is redissolved in alcohol at 90°.

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* In this last state, the gold is reduced, indeed, the precipitate is insoluble in water, alcohol, the caustic alkalis, sulphuric, nitric, and muriatic acids, &c.; it forms with aqua regia a solution which is reduced by the sulphate of protoxide of iron.

* Orfila, *Médecine Légale*, t. III. p. 361.

† *Journal de Chimie Médicale.*

‡ *Journal de Chimie Médicale;* from *Jahrbuch für Praktische Pharmacie.*

Nigellin is presented under the form of a yellowish liquid of the consistence of turpentine; it has a faint odor, and a very bitter taste. Water and alcohol easily dissolve it. All the properties mentioned by the author show that this matter is not a pure proximate principle.

CURE OF SYCOSIS BY A SOLUTION OF CREOSOTE AND A SOLUTION OF CHLORIDE OF LIME.*

BY DR. HIRZ.

A young man, who for several years had been afflicted with an obstinate sycosis situated on the right side of the face, covered by the whiskers, was ultimately entirely delivered from this disagreeable disease, by the alternate use of a solution of creosote, and of a solution of chloride of lime, both applied in fomentations, by the aid of double compresses.

To assist the action of this topical treatment, the administration of a purgative composed of calomel and jalap was, from time to time, joined to it.

After the disappearance of the cutaneous affection, there remained no traces of it, except a few cicatrices, bearing some analogy to those left by confluent small-pox.

PREPARATION OF CITRATE OF IRON.

BY M. HECTOR BERNIER.

In the *Journal de Chimie Médicale* for December, 1842, M. H. Bernier publishes the following method of preparing citrate of iron:—

℞	Pure protosulphate of iron	1
	Carbonate of soda	1·5

After having separately dissolved the salts, the solutions are mixed: the precipitated carbonate is collected on a filter, and washed with distilled water to free it from any sulphate of soda which it may retain; after this washing, it is put into a porcelain capsule with a little distilled water; pure citric acid dissolved in the smallest quantity of water is then added to the liquor, which is kept stirred, until the carbonate of iron is partly decomposed; the liquor is then left to itself for one or two days, and occasionally stirred. If the carbonate of iron is not entirely dissolved, a few drops of citric acid are added, and it is filtered.

In this manner a very concentrated solution of citrate of iron is obtained, and nothing further is required but evaporating it in flat-bottomed porcelain plates, at a temperature of 25° to 30° C.

This process yields citrate of iron of a fine garnet color. We may thus, with almost all the weak acids, prepare salts of iron.

OINTMENT FOR AFFECTIONS OF THE NIPPLES.*

BY M. RIGHINI.

℞	Simple ointment	24 grammes.
	White-lead ointment	8 grammes.
	Deutoxide of lead	2 grammes.
	Peroxide of mercury	6 decigr.
	Deutosulphuret of mercury	3 decigr.

F. S. A. an ointment. A small quantity is rubbed with the finger on the diseased nipple.

When the nurse wishes to give suck, she should wash the nipple with slightly alkaline water, then with pure water.

ON MEDICAL REFORM.

To the Editors of The Chemist.

Gentlemen,—

As it appears from the public prints that the Government intends introducing, during this session of Parliament, some measures for the future regulation of the Medical Profession, the announcement naturally excites our hopes and fears, inasmuch as we know not yet how the Profession or ourselves will be affected thereby: but if we may thus prematurely anticipate that "*very great and important changes are on the eve of introduction*," I, for one, shall be disappointed; for we may infer, from the few sentences which fell from the lips of the Home Secretary, that such measures only will be brought forward as will be in strict conformity with the Colleges with which the Government has been in correspondence; this, I have no doubt, Gentlemen, will be the amount of reform propounded, and therefore it ought to be narrowly watched and commented on by yourselves and the press generally, in order, if possible, to point out what is really required "*to constitute an efficient reform throughout the whole system of medical science.*"

Why should not the Profession be established afresh, and assimilated as nearly as possible to the practice in France, Germany, and other countries? Why not separate the Profession into four distinct parts, binding each to keep within its own sphere of operation under a penalty, and authorising certain fees to be paid for advice to the physician, surgeon, and apothecary; the dispensing and sale of medicines to be confined to the chemists and druggists: each would then have his own peculiar part allotted, without, as now, trenching on others' ground; besides, it would annihilate the evil of patients being inundated with physic—the undignified and general mode of paying the doctors.

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* *Caspar's Wochenschrift für die gesammte Heilkunde*, No. 35, 1842.

* *Journal de Chimie Médicale.*

There are some points which strike me as essential to medical reform; and as a further protection to the public, I would have a clause introduced in the bill, inflicting a heavy penalty on all ignorant and unqualified persons vending and dispensing medicines.

I am, Gentlemen,
Yours respectfully,
Feb. 15, 1843. PATRIOTICUS.

[We could wish, like our correspondent, to see the Profession divided into four distinct classes: but the plan is beset with difficulties, the chief of which, perhaps, are attributable to the druggists and apothecaries. Would the former consent to the loss of their *counter practice?* Would the latter willingly give up dispensing? Moreover, we fear that patients would not know whether they should apply to the surgeon or to the apothecary; indeed, some diseases being claimed by both, these two would be ever and anon encroaching on the province of each other. However, the division would be beneficial, if practicable. Many proposals for reforming the Profession have been submitted to us, and perhaps among the best of them is that which consists in uniting the apothecary with the druggist—that is, giving, on examination, an apothecary's license to the druggist, of course leaving the physician and surgeon, as heretofore, entirely distinct.

Among other provisions, any Medical Reform Bill that may be passed, should give to the body to be entrusted with the management of medical affairs, power to expel from the Profession those mountebanks who prostitute their diploma by resorting to the worst of quackery. Of course, this power should be put into execution only after the case has been thoroughly investigated.]

IV. REVIEWS AND NOTICES OF BOOKS.

ON THE TREATMENT OF STONE IN THE BLADDER, BY MEDICAL AND CHEMICAL MEANS. By R. WILLIS, M.D., of the Royal College of Physicians, Physician to the Royal Infirmary for Children, &c. London: H. Baillière, 219, Regent Street. pp. 183.

THE relative merits of the medical and mechanical methods of removing calculi from the bladder have for a long time been subjected to very earnest discussion on the part of the partisans of each, especially in France. The treatment of stone by medical, or rather chemical means, has been, and, in spite of facts, still is, strenuously opposed by surgeons. In this opposition, and in the upholding of the mechanical modes of treatment, there is, we fear, a large amount of sordidness—a desire to maintain within their practice a class of diseases, which is to them a considerable source of profit. This, at least, is certain; if they have been actuated by a solicitude for their patients' weal, their philanthropy has been mistaken.

In this discussion, as is ably shown by Dr. Willis in the excellent treatise before us, the disputants have scarcely been on an equal footing. The patients have, in general, inclined to surgical treatment, owing to the promptitude of the relief which it affords, compared with the show and progressive action of medicinal agents, in the use of which, especially when the stone is large or otherwise difficult of solution, it is frequently necessary to persevere for a long time, with only very gradual relief. We cannot express ourselves on this point better than in the forcible language of our author himself:—

"To say nothing of the doubt that has always hung around their efficient and practical applicability, the medical means we possess of attacking stone in the bladder are very slow in their effect, and all know how difficult it is to manage the generality of patients in cases where perseverance is indispensable, and where the result has to be looked forward to at a distant date. In the present time, too, the generality of practitioners are but indifferently acquainted with urinary pathology,—the subject is one that is little studied; or they have no confidence in lithontriptic medicines. The surgeon, indeed, may be little or no better provided than the physician in the important article of the particular pathological knowledge that is necessary here; but he has sounds, and catheters, and lithontriptors, and scalpels at hand, and in these he has unlimited faith.

"The patient with a stone in his bladder, then, who consults the physician, is usually put into the best plight possible, and anon comes in the surgeon, and, in two or three minutes' time, exhibits to him the cause of all his sufferings, firmly held between the chops of a pair of tongs. A triumph of this kind is not lightly to be foregone: and so long as mechanical means of removing a stone from the bladder are held on the whole to be tolerably safe in their application, it never will be foregone. Neither is it to be expected that any others, necessarily of slow operation, and of which the triumph must be altogether without *éclat*, will be anxiously sought after by the operating surgeon. Nevertheless, it will be seen in the sequel, that all the mechanical modes hitherto devised, and generally practised for the removal of a stone from the bladder, are fraught with so much danger both present and prospective to the patient, that the interests of humanity and of true science alike command us to go and strive to improve upon aught that has ever been done in the way of treatment otherwise than by operation; and further, should the necessity for operating arrive, to inquire whether there be not better methods of proceeding than those that are in common use at present."

The patient is seldom, if ever, aware of the risk he incurs by submitting to the operation either of lithotomy or lithotrity.

It has ever been our opinion, both publicly and privately expressed, that much greater advantage may be derived from the treatment by medico-chemical means, of calculous affections, than by surgical operations; and our readers will come to the same conclusion, when they have perused the work under consideration.

It is not necessary to give an analysis of the arrangement and contents of this treatise. Suffice it to say, that it gives a description of the treatment by solvents administered internally and by way of injection, and of the operations of lithotomy, lithotrity, lithectasy, and cystectasy, and that the author discusses the matter in dispute temperately and impartially, conveying his ideas in language remarkable for its simplicity and explicitness. Dr. Willis has brought very extensive reading and research to bear on this able work, and proves himself highly competent for the task which he has undertaken and most creditably accomplished. The following is from Chap. I. p. 35:—

"The medical treatment of stone in the bladder has indeed assumed an entirely new aspect of late years, and the subject is not yet by any means exhausted. In the preceding paragraphs the effects of the alkaline mineral waters of Vichy have been particularly dwelt upon, because the influence which these waters exert upon the urine, and through it upon urinary calculi, have been very carefully studied in recent times. The Vichy water, however, influences the urine and the greater number of the deposits that take place from that fluid solely in virtue of the bicarbonate of soda which it contains; this salt administered in simple water, or in water surcharged with carbonic acid in imitation of the natural mineral water, of itself possesses properties chemically and physiologically of precisely the same kind as the Vichy water. Simple solutions of soda, and artificial mineral waters, however, are never borne so well by the stomach as those that are presented to us by the hand of Nature. This is particularly the case with the artificial Vichy water. Nor is this objection met in every point by the use of the transported natural mineral water. A course of mineral water at the spring, has the vast advantage of securing the individual whilst pursuing it against countervailing influences of every kind; to say nothing of the circumstance that the water, costing little or nothing at the fountain head, is always taken in quantities that would be felt as ruinously expensive if used at a distance.

"The bicarbonate of soda in solution, or as it occurs in the Vichy water, is of service in cases of calculus by rendering the urine alkaline. But the alkaline carbonates, whether of soda or potash, are not the only, nor perchance the best, salts that may be employed in this direction. The neutral citrate, malate, and even tartrate of potash and of soda, taken by the mouth, render the urine very promptly alkaline, and have precisely the same effect as the carbonate and bicarbonate of the same bases. These neutral salts are in fact decompounded in their transit through the body, making their appearance in the urine in the shape of carbonates, and attacking urinary concretions contained in the bladder, just as the bicarbonates do when administered directly by the mouth. These neutral salts, composed of a vegetable acid and an alkaline base, have this advantage over the bicarbonates—that they do not combine with and render inefficient the natural acid of the stomach, which we now know plays so important a part in the function of digestion; they can therefore be taken for even longer periods than the bicarbonates without weakening the stomach, and without interfering with the changes which the food must undergo in that viscus to be made fit to furnish the body with materials for its growth and nourishment.

"There are yet other alkaline salts which pass readily from the stomach into the blood, and from thence find an exit by the kidney, which have a still more decided action as solvents of lithic acid than the alkaline carbonates. These are the bonates of potash and soda. I am not certain, however, that the borates are really so well fitted as the carbonates to attack the generality of urinary calculi. They have not been shown to possess the same faculty of combining with and dissolving the mucus or animal matter that enters into the constitution of the majority of calculi in such large proportion, and so they may fall short of the carbonates in disintegrating power. The borate of potash or of soda may, nevertheless, be found useful in certain cases. It may be taken in doses adequate to keep the urine constantly impregnated with it for months, without any detriment to the function of digestion or to the general health.

"The very latest researches have added another substance to the catalogue of legitimate lithontriptics, which will very certainly yet be found of signal service in the treatment of numerous varieties of calculous diathesis. This is the benzoïc acid,—one of the few substances of its class which is readily absorbed into the system, and, like the alkalis, finds its way out again by the kidney. It is but yesterday since this acid, from its physiological affinities and its known capacity to combine with the uric acid, and to convert a most insoluble into an extremely soluble substance, was recommended in gout by Mr. Ure,* as calculated to prevent the deposition, and even to effect the removal of the tophaceous masses of urate of soda, which are so commonly seen about the joints in inveterate cases of that disease; and if the uro-benzoïc acid, which is found in the urine when benzoic acid is exhibited by the mouth, have the power of combining with the earthy phosphates, as I have been assured it has by the ingenious surgeon just named, we are weaponed afresh and more effectually than ever against urinary concretions, for the uro-benzoates are all salts of most easy solubility.† By treating a small calculus of uric acid alternately with a solution of biborate of soda and of benzoate of ammonia, I certainly found it reduced, dissolved and disintegrated with singular rapidity; and there can be no doubt of the immediate effect which the benzoic acid and benzoate of ammonia taken into the stomach have in rendering the urine clear and limpid in cases where it had long been turbid in consequence of depositing the lithic acid and lithate of ammonia. M. Leroy, of Paris, is reported to have used these substances in a case in which renal calculi of the lithic acid had for a long time been formed in large quantities. I believe them fully competent to prevent the formation of every modification of lithic acid gravel and calculus."

The following is taken from the Appendix:—

"ACTION OF THE VICHY WATERS ON CALCULI OF THE LITHIC ACID, AND OF THE MIXED AND TRIPLE PHOSPHATES.

"M. Chevallier* was the first who instituted direct experiments on the powers of the alkaline waters of Vichy to dissolve and disintegrate urinary calculi. The following are the particulars of some of his trials:—

"1. A quantity of lithic acid gravel was subjected to the action of the Vichy water, kept at a temperature of 97° F. The concretions were speedily destroyed, the lithic acid being entirely dissolved, and nothing remaining suspended in the fluid but a few loose flocculi of animal matter.

"2. The half of a lithic acid calculus weighing 1 ounce, 1 drachm, 36½ grains, was placed in a little bag of wire muslin, and subjected to the action of the Vichy water during 151 hours. Dried carefully and weighed after this, the calculus was found reduced to 2 drachms, 52 grains, so that in a week it had actually lost 6 drachms, 47 grains, or more than two thirds of its original weight.

"3. In another experiment, five calculi,—one of phosphate of lime, weighing 1 drachm, 18 grains; a second of lithic acid, weighing 1 drachm, 8 grains; a third of lithic acid, weighing 25 grains; a fourth and fifth, fragments of phosphatic calculi, weighing, the one 29 grains, and the other 13 grains,—were enclosed together in a bag of wire muslin, and exposed on the 5th September to a constant stream of the Vichy water of the temperature of about 98° F. On the 11th September, the bag, being examined, was found completely empty; the calculi of lithic acid had been dissolved; those of the phosphates disintegrated, and their particles washed through the meshes of the muslin.

"Many experiments on the solution and disintegration of calculi by the Vichy waters were performed by Dr. Ch. Petit,† a few of which are here selected.

"1. Two pieces of a calculus, laminæ of a large lithic acid concretion, weighing 31·38 grammes,‡ after exposure to the action of the Vichy water during 23 days, were found to weigh only 8·65 grammes, so that they had lost 72·79 per cent.

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* *On Gouty Concretions, in Trans. of Royal Med. and Chir. Society.* Vol. XXIV. Lond. 1841.

† *Vide* Berzelius' *Traité de Chimie*, tom. VII. p. 366.

* "*Essai sur la Dissolution de la Gravelle, &c.* 1837."

† "*Nouv. Obs. sur la Dissolution de Calculs, &c.*"

‡ "A gramme is about 15 grains."

"2. A piece of ammoniaco-magnesian phosphatic calculus, weighing 31·50 grammes, immersed for 18 days in the water, was found reduced to 17·25 grammes, so that it had lost 45·23 per cent.

"3. The half of a lithic acid calculus with traces of lithate of ammonia, weighing 40·80 grammes, immersed for 30 days, was found reduced to 24·65 grammes, and had therefore lost 39·58 per cent.

"4. The half of a calculus of triple phosphate of ammonia and magnesia, with traces of lithic acid, which weighed 16·25 grammes before immersion in the water, after exposure to its influence, weighed but 6·65 grammes, and had consequently lost 49·07 per cent.

"5. Half of a triple phosphatic calculus, of a greyish white color, weighing 9·20 grammes, after 20 days' immersion, weighed 2·60 grammes, and thus lost 71·75 per cent.

"6. A small calculus of lithic acid, weighing 2·75 grammes, after 43 days' immersion, weighed but 0·70 of a gramme, and had therefore lost 74·54 per cent.

"7. Half of a calculus of lithate of ammonia, with traces of phosphate and oxalate of lime, weighing originally 3·05 grammes, after 18 days' exposure, weighed 1·20 grammes, and had lost 60·65 per cent.

"Contrary to the usually entertained opinion, M. Petit found that, on the whole, calculi of the triple phosphate of ammonia and magnesia lost more under the action of the Vichy water, *i. e.* of a solution of bicarbonate of soda in water supersaturated with carbonic acid, than those of the lithic acid. For example:—

"Five specimens of lithic acid calculi, weighing together a little more than 118 grammes, after remaining, on an average, 27 days exposed to the action of the water, lost nearly 64 grammes, or 53 per cent. of their original weight; but five specimens of the ammoniaco-magnesian phosphatic calculus, which together weighed 97½ grammes and only remained under the action of the water, one with another, for the space of 23 days, lost 58¾ grammes, or 60 per cent. of their original weight.

"M. Petit, like M. Chevallier, found that the Vichy water had extremely little influence on calculi of the oxalate and phosphate of lime. This water, however, would dissolve calculi of cystine and lithic oxide, with at least as much readiness as it disintegrates and dissolves those of lithic acid and the triple phosphate. Water surcharged with carbonic acid and holding a little bicarbonate of soda in solution, is consequently a solvent for the calculi of every description that are of somewhat frequent occurrence, save those of oxalate of lime. Such a water will, therefore, attack something like nineteen twentieths of all the known varieties of urinary concretion.

"The destruction of urinary calculi by an alkaline water is found to be not merely, nor perhaps even principally, by the way of solution; it is accomplished in a very considerable degree, especially as regards those of the triple phosphate, by a kind of disintegration of their component particles. When calculi which consist principally of the oxalate or phosphate of lime are mingled with a little lithic acid, lithate of ammonia, or triple phosphate, which they are very frequently, the alkaline water attacks and disintegrates them rapidly, so that the sphere of its activity is still further extended."

In Appendix E, our author, after treating of the "composition of injections for the solution of calculi, and means of using them," says:—

"Calculi of the oxalate of lime are beyond the reach of solvents, and ought to be removed by mechanical means,—by lithotrity if very small, and not of such hardness to induce risks of breaking or bending the lithontriptor; by lithectasy, if they be hard, or of a size exceeding a nutmeg." Now we are of opinion that less difficulty will attend the solution of a calculus of this description than Dr. Willis imagines, as oxalate of lime may be dissolved, although not very readily, in any of the acids which will dissolve the bone phosphate, or any of the other insoluble salts of that base, among which acids are the nitric, hydrochloric, the acetic, and lactic.

We conclude our notice of this work with a well-merited eulogium. It is deserving of an attentive perusal.

As we hope shortly to take up the subject of the solution of stone in opposition to the bigoted views of those who advocate the systems of lithotomy and lithotrity, we would suggest to such of our readers as take an interest in the matter, to study the work in question, in order that they may be the better prepared for our future observations. If the non-professional public would devote a few hours to the perusal of this treatise, we should less frequently hear of deaths from the above-mentioned operations and their consequences.

BOOKS RECEIVED.*

On the Chemical Discriminations of Vesical Calculi. By E. A. Scharling, A.A., L.L.M. Professor of Chemistry in the University and Polytechnic School, Copenhagen. Translated from the Latin, with an Appendix, containing Practical Directions for the Recognition of Calculi. By S. Elliott Hos-

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* These will be reviewed in our next.

KINS, M.D. With Plates. London: John Churchill.

A Guide to the Urinary Cabinet. By ROBERT VENABLES, A.M., M.D. London: G. Knight and Sons, Foster Lane.

TO CORRESPONDENTS.

"A READER FROM THE COMMENCEMENT."—The year of Our Lord is always inserted at the bottom of the first column in each No. If our correspondent had looked there, he would have saved the confusion of which he speaks. We shall be glad of the paper promised at as early a period as convenient. If our correspondent will furnish us with his name and address, we will forward to him a copy of the Regulations of the *London Electrical Society.*

A CORRESPONDENT (who writes from Plymouth) is thanked for his kind suggestion. The same idea, curiously enough, had occurred to us, and was being acted on, when our correspondent's letter reached us.

The EDITOR of the *Medical Times* is informed that we are far from satisfied with his reply. We consider that the very shallow pretext of want of space by no means excuses the omission of the sources from which articles are derived. We have seen one of our original articles quoted in other Journals as from the *Medical Times*, because the latter periodical had omitted to append to its abstract the name of "THE CHEMIST." As regards *criticism*, if our contemporary uses the expression as we understand it, we assure him that we are fearless on that score. We regard the answer to our note as highly discreditable to the person who penned it.

"A."—The apparatus may be obtained from Messrs. Knight and Sons, Foster Lane, Cheapside, London.

PRIVATE LETTERS have been sent to several correspondents.

To SUIT the convenience of such of our readers as may wish for answers to questions sooner than can be obtained through the "NOTICES" in our Journal, we have determined on the following. Letters sent *before* the 10th of each month will be answered on that day by private letter; those which are sent after that time, on the 20th; after the 20th, letters will be answered in the Monthly No., or privately, on the 1st. Correspondents must send us their names and addresses; or initials, and the post-offices of their districts, will do. As this arrangement is for the benefit of our readers, postage stamps should be enclosed when private letters are requested in reply.

"VIRTUTAS."—Your letter shall be inserted in our next. This postponement is quite unavoidable.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN JANUARY, 1843.

BY. E THOMPSON.

BAROMETER.

Monthly mean	29·48
Mean at 9 A.M.	29·47
Mean at 3 P.M.	29·43
Mean at 9 P.M.	29·47
Maximum on 19th . . .	30·30
Minimum on 13th . . .	27·90!
Range	2·40

THERMOMETER.

Monthly mean	37°
Mean of maxima . . .	41
Mean of minima	34
Maximum on 27th . . .	52
Minimum on 11th . . .	24
Range	28

WIND.

	Days.		Days.
N.	0	S.	0
N.E.	0	S.W.	5
E.	1	W.	16
S.E.	3	N.W.	3

RAIN.

2·33 inches.

WEATHER.

Clear . . .	0	Frost . .	10
Cloudy . . .	11	Asteroids	0
Overcast . .	3	Lunar halo	2
Showers . .	12	Hoar frost	1
Continued rain	1	Mist . .	9
Snow . . .	6		

GENERAL REMARKS.

The pressure of the atmosphere during the month has been very variable. The greatest pressure on the 19th occurred after a thaw, and was followed by fair and mild weather. On the 13th the mercury descended lower than it has been for many years. This extraordinary depression was followed by a snow-storm, which was not of long continuance, nor accompanied by a very high wind.

The temperature has generally been mild and equable, the mean heat of the day having exceeded that of the night only by 7° C.

The prevailing diseases have been synochus, typhus, and a mild form of rubeola.

NOTA BENE.—*All Communications and Books for Review must be addressed "To the Editors of the Chemist, Care of Mr. Hastings, Publisher,* 13, *Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ANALYSIS OF ORGANIC AND MINERAL CHARCOALS.*

BY J. L. LASSAIGNE.

THE different kinds of charcoal, organic and mineral, are so varied in their uses, and their properties, established with relation to the quantity of carbon which they contain, may be so often altered by the mixture of different substances, that it is important, in a great number of cases, to be able to estimate their real value.

The object of this paper is to explain the simple processes to be used for analysing the charcoals of wood, bone, turf, and schist, so much used in domestic and industrial economy.

WOOD CHARCOAL.

This kind of charcoal, which results from the decomposition by heat of the ligneous parts of trees, contains carbon still combined with a little hydrogen, salts of potassa and lime, certain metallic oxides, and more or less moisture arising from the condensation of the vapor diffused in the air.

The proportion of water, which amounts, according to Karsten, to 9 or 10 per cent. in wood charcoal, may be accurately estimated by drying at 120° C., in a platinum crucible, a given weight of charcoal reduced to powder.

The volatile hydrogenous matters which remain united to the carbon in the different vegetable charcoals, might be appreciated, as M. Berthier did in his analysis by the dry way, by calcining, out of contact of the air, at a white-red heat, charcoal previously deprived of moisture. The difference of weight after the experiment would give the quantity of volatile hydrogenous matters. It would be preferable to burn a portion of dry charcoal by means of binoxide of copper, employing the apparatus used for the analysis of organic matters, collecting the water and the carbonic acid, which would accurately show the proportion of hydrogen and carbon.

The fixed matters composing the ordinary ash of charcoals would be obtained by the incineration, in contact with the air, of a certain quantity of charcoal. The nature and the quantity of the salts which form the ash would be known by washing it with warm distilled water, and filtering the liquor to separate the insoluble parts.

The salts soluble in water are the subcarbonate of potassa, the sulphate of potassa, the chloride of potassium, and sometimes the subsilicate of potassa. The mixture of these different salts being obtained by the evaporation to dryness of the aqueous solution, it is divided into three or four parts. One of these portions is employed for the determination of the quantity of the carbonate of potassa, by known alkalimetrical processes; the second portion is used for estimating the proportion of sulphate of potassa by means of its decomposition by a soluble salt of baryta, after having saturated the saline solution by nitric or hydrochloric acid: the weight of dry sulphate of baryta enables us to calculate that of the anhydrous sulphate of potassa to which it corresponds. The estimation of chloride of potassium is easily made with another portion of salt, whose aqueous solution, saturated with nitric acid, must be precipitated with nitrate of silver. The presence of silicic acid may be proved by supersaturating, by any acid, the alkaline solution, evaporating to dryness, and redissolving in warm distilled water.

The insoluble matters of the ash should be treated cold by weak hydrochloric acid, which decomposes and dissolves the carbonates, and renders soluble the phosphate of lime and the oxide of iron which may be found in it. The silicious sand which charcoal contains is insoluble in the latter agent.

The hydrochloric solution, supersaturated by ammonia, allows phosphate of lime and peroxide of iron to precipitate, which are collected together on the same filter. Oxalate of ammonia, poured into the filtered ammoniacal liquor, precipitates oxalate of lime, which, decomposed by calcination, is converted into quicklime: finally, if carbonate of magnesia formed a constituent part of the ash, its base would be met with in the liquor from which the lime had been separated by the oxalate of ammonia; its presence would be demonstrated by phosphate of ammonia, which would precipitate it in the state of very sparingly soluble double salt.

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* *Journal de Chimie Médicale*, February, 1843.

ANALYSIS OF BONE CHARCOAL.

This charcoal, produced by the calcination of the bones of animals, is a mixture of carbon still containing hydrogen and nitrogen, phosphate of lime and carbonate of lime, with which are found associated small quantities of phosphate of magnesia, oxide of iron, alumina, silica, and some soluble alkaline salts, such as chloride of sodium, carbonate and phosphate of soda.

This charcoal, reduced to a more or less fine powder for industrial purposes, absorbs a certain quantity of humidity, which may easily be estimated by desiccation at 120° C., in an oil-bath. Thus dried, if it be calcined in the air, in a platinum or porcelain crucible, it leaves a white ash, whose weight shows, by the difference, that of the combustible matters which existed in it.

The ash of this charcoal is entirely soluble with slight effervescence in dilute nitric or hydrochloric acid, when insoluble extraneous matters have not been added to this product, in commerce, or in its manufacture; phosphate of lime and phosphate of magnesia are isolated by its supersaturation with liquid ammonia; the precipitate collected on a filter and calcined at a red heat, afterwards gives the proportion of these earthy phosphates. The liquor from which these salts have been separated contains all the lime arising from the carbonate which existed before the solution; it may be precipitated in this state, by neutral carbonate of soda.

The quality and the quantity of the soluble alkaline salts which remain accidentally mixed with the bone charcoal, and which arise from the liquids contained in the vessels which penetrated these organs, may be estimated with facility by washing with boiling distilled water a weighed quantity of bone charcoal, evaporating the aqueous solution to dryness to collect the various salts, and afterwards to examine them in order to ascertain their nature by the ordinary means.

The exact proportion of pure carbon can be determined only by the combustion of a portion of very dry charcoal in a tube with binoxide of copper, operating as in the analysis of an organic substance.

The nitrogen which the charcoals of animal matters always contain, and particularly the charcoal obtained from bones, may be estimated by introducing into a combustion-tube, first a few grammes of pure and dry carbonate of lead, covering the latter with a mixture of one or two decigrammes of the charcoal to be tested, with 10 grammes of binoxide of copper, and the covering this mixture with a layer of oxide mixed with roasted copper shavings, then with a layer of copper turnings. The tube being furnished with another tube entering into a basin filled with mercury, a portion of the carbonate of lead is heated over a spirit lamp, in order to free the apparatus from air. When it is ascertained that pure carbonic acid is disengaged, a graduated bell-glass, partly filled with mercury and a solution of caustic potassa, is placed over the orifice of the tube, and the other portions of the tube are gradually heated to redness. The gases which pass into the bell-glass are carbonic acid and nitrogen; the former is easily absorbed, and the latter remains. The volume of the nitrogen is determined by taking an account of its temperature, of its pressure, and of the aqueous vapor which it may contain at the temperature at which the experiment is made.

TURF CHARCOAL.

Charcoal prepared with turf, is tender, friable, and light; it easily inflames, and burns slowly, producing a light flame without smoke. This charcoal contains carbon, a little hydrogen and nitrogen, and ashes composed of silica, alumina, oxide of iron, lime and magnesia. Its analysis may be made by the means above indicated. The residue of the incineration being treated by hydrochloric acid, and heated, leaves silica and a small quantity of alumina, which may be separated by fusing this new residue with three times its weight of hydrate of potassa.

PIT-COAL.

The varieties of pit-coal, all of which are composed of the same elementary principles, —carbon, hydrogen, oxygen, and sometimes nitrogen, combined in a multitude of different proportions,—are very often mixed with argil, carbonate of iron and iron pyrites: the latter substance is injurious to the qualities of this combustible. From their properties and composition, pit-coals should be regarded as solid bitumens, whose matter is entirely mixed with the mineral substance constituting the rock in which they are contained. The analysis of pit-coal may be made by different processes. 1st. By distilling a dry portion in order to obtain and examine the exact quantity and nature of the gases formed during this operation, and to ascertain the proportion of coke which they may yield.

The combustion, in the air, of a certain quantity of pit-coal, will show the proportion of ash, and an ulterior examination will give its composition.

The proportion of pyrites contained in pit-coal, may be determined by heating a portion reduced to powder, with a sufficient quantity of nitro-hydrochloric acid. The sulphur and the iron are converted, the former into sulphuric acid, and the latter into peroxide of iron. The solution is diluted with water, and after having beeen filtered, it is precipitated by an excess of ammonia; the hydrated peroxide of iron is received on a weighed filter, washed, dried, and calcined at a red heat in contact with the air. By its weight, that of the pyrites may be calculated; for, according to M. Berthier, 100 of peroxide of iron are equal to 152 of pyrites.

Before the precipitation by ammonia, the quantity of sulphuric acid formed may be estimated by a solution of chloride of barium. The weight of the sulphate of baryta enables us to calculate that of the sulphur which was combined with the iron in the coal.

The proportion of protosulphuret of iron contained in cokes obtained from coals containing pyrites, may be estimated in the same manner, only in calculating, it must be borne in mind, that 100 of peroxide of iron correspond to 110 of protosulphuret of iron. In the preparation of coke, persulphuret of iron is converted by the heat into fixed and undecomposable protosulphuret.

CHARCOAL OF SCHIST.

In certain stratiform mountains, bituminous schists are met with in a very considerable layer, almost always accompanying the coaly soils. These schists, which are a mixture of argil and bitumen, furnish by calcination a light and friable charcoal. This product, which is now employed in the arts on account of its decoloring power, is sometimes substituted for bone charcoal, or mixed with it.

Charcoal of schist owes its decoloring properties to the extreme division of the carbon which it contains, and which is disseminated in a greater or smaller quantity of clay and carbonate of lime. Its analysis may easily be executed by one of the means above-mentioned. After having dried in an oil-bath a portion of pulverised charcoal, it is weighed to estimate the hygrometric water which it contained. The residue of this desiccation is afterwards treated by boiling water in order to dissolve the sulphate of lime, whose proportion is known by the difference of the weight of the residue of this first operation. By afterwards reacting on this charcoal, thus washed with boiling water, with a weak hydrochloric acid, the carbonate of lime, which may be found naturally mixed with the schist, is dissolved without attacking either the charcoal or the argil. The proportion of the former with respect to that of the argil, may be deduced by the residue left by charcoal treated by hydrochloric acid, when it is calcined in the last place in a crucible in contact with the air. The absence of earthy phosphates in the charcoal of schist, the presence in the ashes of this charcoal of a very large proportion of silica and alumina, associated with peroxide of iron, prevent it from being confounded with animal charcoal.

ON THE NECTAR OF FLOWERS.*

BY M. HENRY BRACONNOT.

The name of nectar is given to the sweet liquor excreted in the corollæ of many plants, and with which bees prepare their honey. Naturalists suppose that the latter substance does not sensibly differ from the saccharine matter of the nectar, also regarded, by M. de Candolle, as formed of a hydrated sugar, similar to that of honey. However, it does not appear that, until now, experiment has been invoked to justify this opinion, since there exists no analysis of nectar. In the sixty-third vol. p. 102, of the *Annales de Chimie*, it is announced, in a note, that Fourcroy, Vauquelin and Bosc, observed on the receptacle of the flowers of the *Rhododendron ponticum*, grains of manna or of concrete sugar; but this saccharine matter appears not to have been analysed.

Such are the reasons which have induced me to examine nectar.

I procured this liquid from a very great number of different flowers; but as it is less disseminated in the monopetalous corollæ, I have most frequently given them the preference.

Indeed, it is necessary only to press their tube gently between the fingers, over watch glasses, or plates of glass, to obtain the nectar from them.

This liquid is saccharine, limpid, colorless, almost always uniform in most of its properties. It has no reaction on litmus paper, and is not sensibly affected by reagents, such as lime-water, baryta-water, oxalate of ammonia, nitrate of silver, and subacetate of lead; it seems to act like a solution of sugar, leaving, after evaporation and combustion, only traces of slightly alkaline ash; but this sugar is not, as is believed, similar to that of honey, for all the nectar which I have hitherto examined, has furnished, at the end of several days, in dry weather, clearly defined crystals, perfectly limpid, affecting the form of short prisms, with four or six faces, and with sharp angles; these crystals have besides all the other characters of the purest cane sugar. It constitutes, indeed, a considerable part of the saccharine matter of nectar, in which I have also detected another uncrystallisable sugar, attracting moisture from the air, and which absolute alcohol may separate, to a certain extent, from crystallisable sugar. The following is a list of flowers, in different families of the vegetable kingdom, whose nectar has constantly presented to me these two kinds of sugar:—

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* *Journal de Chimie Médicale*, Jan. 1843.

Phlomis tuberosa.
Lavendula multifida.
Betonica grandiflora.
Lamium garganicum.
Linaria orchidiflora.
Usteria scandens.
Mimulus cardinalis.
Ruellia elegans.
Trifolium alpestre.
Fuchsia coccinea.
Polemonium cœruleum.
Bonplandia geminiflora.
Pelargonium inquinans.
Pelargonium zonale.
Lonicera caprifolium.
Houstonia coccinea.
Viola tricolor.
Lycium afrum.
Nicotiana glauca.
Œnothera suaveolens.
Gesneria coperi.
Crucianella stylosa.
Delphinium Ajacis.
Verbena teucrioïdes.
Verbena Chamædrioïdes.
Passiflora filamentosa.
Plumbago zeilanica.
Lilium croceum.
Zephiranthes grandiflora.
Fumaria lutea.
Dianthus plumarius.
Saponaria officinalis.
Citrus aurantium.
Campanula medium.
Cactus Ackermanni.
Cactus speciosus.

The nectars of these different kinds of flowers appeared to me, in general, to contain only slightly variable proportions of uncrystallisable sugar, and of cane sugar; however, the quantity of the latter seemed to augment sensibly in the nectar of certain flowers. Thus, that of the cactus presented, by crystallisation, only pure sugar, free from uncrystallisable sugar. A single flower of the *cactus Ackermanni* yielded nearly a decigramme. As soon as this flower has arrived at its last degree of development, and is beginning to fade, I have seen the nectar trickle from the corolla in large drops, which, falling on the ground, ultimately concreted into a very white and pulverulent crystallised sugar.

It appeared to me, in general, that the composition of the nectar of flowers may be established as follows:—

Cane sugar	13
Uncrystallisable sugar . .	10
Water	77
	100

I have not detected in the liquid either gum, mannite, or sugar of honey.

Botanists admit that the nectar is produced by glandular bodies, situate in the vicinity of the ovary. This is true in several instances; but it must also be admitted that we are far from knowing the purpose and the structure of all these bodies of glandular appearance, and whose anomalous form is often so singular.[*] There are corollæ of very considerable size, which, from their structure, appear not to be in a condition to produce nectar; there are others in which the most accurate examination cannot discover any peculiar glandular apparatus, and which do not allow of the production of a very abundant saccharine excretion; so that it appears to me very probable, that the nectar often takes its origin from the rupture of the cellular tissue, deprived of the contact of light, and gorged with juices which are extravasated at the time when the corolla begins to lose its freshness. It is, indeed, in nearly analogous circumstances that the vegetable cellule forms the sugar.

Since, contrary to the received opinion, the saccharine matter of the nectar of flowers is not similar to honey, and since the concrete sugar which it yields has all the properties of cane sugar, it is evident that the latter, by remaining in one of the stomachs of the bee, undergoes an alteration, due, perhaps, to the presence of a free acid, or to any other cause, which makes it pass to the state of sugar of honey, as Hubert's experiments also prove; since it is known that that ingenious naturalist has fed bees entirely on cane sugar, at the expense of which those laborious insects continued to prepare honey and wax.

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[*] I have had an opportunity of observing glands situate very far from the flower, and which exude a saccharine liquor similar to nectar; such are those which are situate on the petiole of several kinds of passion flower.

ON THE EMPLOYMENT OF CYANURET OF POTASSIUM IN CHEMICAL ANALYSIS.*

BY J. HAIDLEN AND R. FRESENIUS.

(*Concluded from p.* 101.)

EMPLOYMENT OF CYANURET OF POTASSIUM IN QUALITATIVE ANALYSIS.

1. CYANURET of potassium is, indisputably, preferable to all other tests for detecting nickel mixed with cobalt. Cyanuret of potassium is added to the acidulated solution of the two metals, until the precipitate formed is redissolved in the excess of the precipitating agent; dilute sulphuric acid is poured into it; the whole is heated and left to settle. A precipitate which is formed immediately or in a short time,—and it matters little whether this be cyanuret or cobalto-cyanuret of nickel,—demonstrates the presence of nickel in a palpable and evident manner.

2. Cyanuret of potassium furnishes a very good means of separating the four metals, which are obtained combined in solution in nitric acid, by the ordinary routine of analysis, (lead, bismuth, copper, and cadmium). An excess of cyanuret of potassium is added to the solution. The lead and bismuth are then completely separated, and may easily be isolated by sulphuric acid; the copper and cadmium are dissolved. An excess of hydrosulphuric acid is passed into the solution; it is heated, and a little cyanuret of potassium is again added; a yellow precipitate shows the presence of cadmium. By the addition of hydrochloric acid to the filtered liquor, a black precipitate enables us to recognise the copper.

EMPLOYMENT OF CYANURET OF POTASSIUM IN QUANTITATIVE ANALYSIS.

All the methods which we give admit of absolute separation.

1. *Separation of Zinc from Lime, Baryta, and Strontia.*— Carbonate of potassa is added to the solution until there is an alkaline reaction, then an excess of cyanuret of potassium, and it is heated. The carbonates of the alkaline earths remain completely undissolved; the carbonate of zinc dissolves with facility. The solution is boiled in a small matrass with hydrochloric acid, nitric acid being added to it, until the hydrocyanic acid is driven off, and the zinc is precipitated by carbonate of soda, observing the precautionary measures which the presence of an ammoniacal salt requires.

2. *Separation of Zinc from Magnesia.*—Precipitate by carbonate of potassa, add a sufficient quantity of cyanuret of potassium to redissolve the zinc, and evaporate the whole to dryness, adding a fresh portion of carbonate of potassa; in treating the residue with water, the magnesia remains insoluble, and the zinc is obtained in solution, in the state of double cyanuret of zinc and potassium.

3. *Separation of Zinc from Alumina.*—An excess of cyanuret of potassium is added to the solution, and heating is avoided. The zinc is dissolved, and a residue of hydrate of alumina is obtained.

4. The separation of cobalt from manganese has already been given by Professor Liebig. (*See* THE CHEMIST, Vol. III. p. 225.)

5. *Separation of Cobalt from Lime, Baryta, and Strontia.*—The acidulated solution is mixed with an excess of cyanuret of potassium, and heated; carbonate of potassa is added; it is boiled, and the cobalto-cyanuret of potassium is separated, by filtration, from the carbonates of the alkaline earths.

6 and 7. *Separation of Cobalt from Alumina and from Magnesia.*—As with zinc.

As Professor Liebig has stated, cobalt may be separated from the cobalto-cyanuret of potassium by fusion with nitre, and thus reduced into a form appreciable by the balance. The black residue of oxide of cobalt, which remains after treating the fused mass with water, in order that its determination may be accurate, should be dissolved in an acid. Caustic potassa is the best reagent for precipitating the cobalt from the solution.

8. *Separation of Cobalt from Nickel.*—(*See* Professor Liebig's Memoir in THE CHEMIST, Vol. III. p. 225.)

9. *Separation of Cobalt from Zinc.*—Cyanuret of potassium is added to the solution, until the precipitate of cyanuret of cobalt and cyanuret of zinc, which is formed at first, is completely dissolved in an excess of cyanuret of potassium. Hydrochloric acid is then added in excess to the transparent yellowish solution of the double cyanurets formed; a white precipitate of cobalto-cyanuret of zinc is thus obtained. If there is an excess of zinc, chloride of zinc remains in solution, and if cobalt is in excess, cobalto-cyanuret of potassium. It is boiled until the precipitate is completely dissolved, and all the hydrocyanic acid driven off. Caustic potassa is then added, until the precipitate of cobalto-cyanuret of zinc, which is formed at first, is redissolved, and it is heated; then the zinc is precipitated by hydrosulphuric acid, and cobalto-cyanuret of potassium, free from zinc, remains in the liquor, and the quantity of cobalt which it contains may be ascertained by the above mentioned method.

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* *Annalen der Chemie und Pharmacie.*

It is easy to perceive that, by means of cyanuret of potassium, nickel, zinc, and cobalt may be perfectly separated from one another. We proceed at first as just indicated: after the addition of caustic potassa, we boil until all the ammonia is driven off, and then obtain a precipitate of oxide of nickel mixed with zinc, and in the alkaline solution cobalto-cyanuret of potassium with the greater part of the zinc. The filtered solution is precipitated by hydrosulphuric acid, in order to separate the cobalt and the zinc. The oxide of nickel mixed with zinc is dissolved in acetic acid, and the zinc is precipitated by hydrosulphuric acid, and the precipitate is put on a filter with the sulphuret of zinc obtained at first. The oxide of nickel is precipitated by potassa from its solution in acetic acid.

10. *Separation of Nickel from Lime, Baryta, and Strontia.*—An excess of cyanuret of potassium is added to the liquor, then carbonate of potassa; it is heated, and the solution of the double cyanuret of nickel and potassium is separated, by filtration, from the carbonates of the alkaline earths. The filtered liquor is boiled for a long time with hydrochloric acid, until all the hydrocyanic acid is expelled; this is the sign by which we ascertain that the decomposition of the cyanurets is completed. The solution contains chloride of nickel; consequently, if potassa be added to it, and if it be boiled until all the ammonia (formed by the decomposition of cyanate of potassa) is disengaged, all the nickel is obtained in the state of hydrated oxide.

11 and 12. *Separation of Nickel from Magnesia, and from Alumina.*—The same as in the case of zinc.

13. *Separation of Lead from Cadmium.*—Cyanuret of potassium in excess is added to the liquor, and it is heated. All the lead is separated, and all the cadmium is dissolved in the state of double cyanuret of cadmium and potassium. The cadmium is precipitated from this solution by hydrosulphuric acid, or else it is boiled until all the hydrocyanic acid is expelled, and it is precipitated by carbonate of potassa. As the precipitate of lead always contains potassa, it is dissolved in nitric acid, and precipitated by oxalate or carbonate of ammonia.

14. *Separation of Bismuth from Cadmium.*—This operation is exactly the same as for the separation of lead from cadmium. The precipitate of bismuth also always contains potassa; it is, therefore, necessary to dissolve it in nitric acid, and to precipitate the bismuth from the solution by carbonate of ammonia.

15. *Separation of Copper from Bismuth.*—This separation is performed in exactly the same manner as that of cadmium from bismuth. The double cyanuret of copper and potassium is converted, by long boiling with hydrochloric acid to which nitric acid has been added, into chloride of copper, and the copper is precipitated by potassa. The sulphurets of these metals may also be completely separated by the solution of cyanuret of potassium. The sulphuret of copper is easily and totally dissolved; the sulphuret of bismuth is not dissolved.

16. *Separation of Copper from Lead.*—The same as with copper and bismuth. Both the methods mentioned are applicable here.

17. *Separation of Copper from Cadmium.*—Cyanuret of potassium is added to the liquor, until the precipitates which are formed are redissolved, and hydrosulphuric acid is driven into the solution, which contains the double cyanurets of copper and potassium, and of cadmium and potassium. The sulphuret of cadmium is completely precipitated, and the whole of the sulphuret of copper remains in solution, if the excess of hydrosulphuric acid be driven off by heat, and if a small quantity of cyanuret of potassium be again added.

It may be precipitated in this state from the liquor by the addition of hydrochloric acid, but it is better to boil it with the latter acid to which nitric acid has been added, until all the hydrocyanic acid is driven off, and it is precipitated by potassa.

18. *Separation of Silver from Lead.*—An excess of cyanuret of potassium is added, and the solution is heated. The lead remains in the residue; the silver is dissolved in the state of double cyanuret of silver and potassium; the cyanuret of silver is separated from the solution by the addition of nitric acid, and in this state it is weighed.

19. *Separation of Silver from Copper.*—Cyanuret of potassium is added until the precipitates which are formed are redissolved, and the silver is precipitated from this solution by hydrosulphuric acid, and then (if, after having stopped the current of this acid, and after having driven off its excess by heat, a small quantity of cyanuret of potassium be again added) the copper remains completely dissolved, or else an excess of nitric acid is added to the solution of the two metallic cyanurets in the cyanuret of potassium, which completely separates the cyanuret of silver, while the nitric acid decomposes and dissolves the cyanuret of copper. The solution is boiled until all the hydrocyanic acid is expelled, and the copper is precipitated.

20. *Separation of Silver from Cadmium.*—Cyanuret of potassium is added until the

precipitates are redissolved, and the cyanuret of silver is precipitated by an excess of nitric acid, which easily decomposes and dissolves the cyanuret of cadmium. It is precipitated from the solution by carbonate of potassa, after the complete expulsion of the hydrocyanic acid by boiling.

21. *Separation of Silver from Bismuth.*—The same as for the separation of silver from lead. Although silver is easily separated by hydrochloric acid from bismuth, cadmium and copper, certain circumstances, especially the presence of lead, may nevertheless render the separation very difficult. In cases of this nature, cyanuret of potassium enables us to obtain an exact and extremely simple separation of these metals from silver.

22. *Separation of Mercury from Silver.*—This observation also applies to the value of the separation of these two metals by cyanuret of potassium. Mercury should, in all cases, be converted into the deutoxide, when it is found in the state of protoxide. Cyanuret of potassium is added until the precipitate formed is redissolved. There remain in solution double cyanurets of silver and potassium, and of mercury and potassium. An excess of nitric acid is then added to it. It decomposes the two double cyanurets, and all the cyanuret of potassium passes to the state of nitrate of potassa. The insoluble cyanuret of silver separates, and the soluble cyanuret of mercury remains in the liquor. It is precipitated in the state of sulphuret by a stream of hydrosulphuric acid.

23. *Separation of Mercury from Copper.*—The same as with cadmium and copper.

24. *Separation of Mercury from Lead.*—An excess of cyanuret of potassium is added, and the solution is heated. The lead remains completely in the residue; the mercury is dissolved; it is precipitated in the state of sulphuret.

25. *Separation of Mercury from Bismuth.*—The same as with mercury and lead.

26. *Separation of Mercury from Cadmium.*—Cyanuret of potassium is added until the precipitate is redissolved; an excess of very dilute nitric acid is poured in, and the mixture is boiled. The cyanuret of mercury is not decomposed, but the cyanurets of potassium and cadmium are converted into nitrates; after having completely driven off the hydrocyanic acid, the cadmium is precipitated by carbonate of potassa; it is filtered, and the mercury is separated by hydrosulphuric acid.

27. *Separation of Platinum from Lead and Bismuth.*—An excess of cyanuret of potassium is added. The lead and bismuth remain in the residue. The platinum is dissolved in the state of double cyanuret of platinum and potassium. The liquor is boiled with hydrochloric acid, until the hydrocyanic acid is driven off; alcohol is added, and the platinum is precipitated by ammonia, in the state of ammoniaco-hydrochlorate of platinum.

How should we proceed, when it is requisite to separate, not only two or three, but several metals? This question is resolved by the foregoing statements.

II. ACTION OF CYANURET OF POTASSIUM ON THE METALLIC OXIDES, SULPHURETS, SALTS, &C., BY THE DRY WAY.

Cyanuret of potassium may be employed in two ways, by the dry way:—

1st. As a reagent with the blow-pipe.

2nd. As a means of reduction in a crucible or glass tube.

We have studied its action in both these respects on a great number of metallic oxides, sulphurets, salts, &c.; however, we will mention only those results which appear to us interesting of themselves, or as regards chemical analysis. We used, in our experiments, sometimes cyanuret of potassium alone, and sometimes a mixture of equal parts of anhydrous soda and cyanuret of potassium. The details of each experiment will be given.

Before the blow-pipe, on account of the too great facility with which cyanuret of potassium fuses, we have always employed the above-mentioned mixture. The latter, in its action, generally so much resembles pure soda, that it appears to us superfluous to give a special description of the manner in which bodies act with it. The essential advantage which it has over soda, cannot, however, be silently passed over. In the first place, the reductions are made with such extraordinary facility, that operators who are not very skilful may, without difficulty, perform reductions which are not, however, very easy, such as that of tin with oxide or sulphuret of tin, &c.; and in the second place, the fused mixture of the cyanuret of potassium with soda, so easily penetrates into the charcoal, that we may always recognise, in the most evident manner, the portions of reduced metal, isolate them with facility, and submit them to ulterior analysis.

The action of cyanuret of potassium on the nitrates and chlorates is quite peculiar; fused with this body, they are decomposed with a loud explosion and appearance of flame; therefore it is necessary, when the experiment is made with large quantities, especially of chlorates, to recommend caution. We possess, therefore, a very sensible means of detecting these salts by the dry way. If they be mixed with cyanuret of potassium, and heated on a sheet of platinum, there always occurs, even with extremely small quantities, an evident detonation and development of light.

The reductive properties of cyanuret of potassium, in its fusion with the metallic oxides and sulphurets, have already been completely made known in the Memoir of Professor Liebig, before referred to. According to our experiments, they also admit of a very important application in the following cases :—

1. *Assaying of Arsenic in impure Sulphuret of Antimony.*—It is known that in the detection, by the blow-pipe, of sulphuret of antimony which contains arsenic, it is not always possible, on account of the production of sulphurous acid, to recognise, with certainty, the garlic odor of arsenic. It has therefore been proposed to commence by reducing the antimony from the sulphuret, by means of fusion with iron, sulphate of soda and charcoal, or in another manner, and then to test with the blow-pipe. This test would leave nothing to be desired, if the preparation of the regulus were not inconvenient, on account of the high temperature which it requires, in investigations on a small scale. Cyanuret of potassium obviates this difficulty, since a well-fused regulus may be obtained in a few minutes, in a small porcelain crucible, by fusing powdered commercial sulphuret of antimony with three or four parts of cyanuret of potassium, over a spirit-lamp. It does not lose more arsenic in this reduction than in the other.

2. *Preparation of Metallic Mirrors with Arsenical Compounds.*—A mixture of equal parts of soda and cyanuret of potassium presents an excellent means for the reduction of the arsenites and arseniates. The perfectly dry arsenical compound is introduced into the bulb of a small tube, with about six times as much of the mixture, also perfectly dried. The bulb must be only little more than half filled; otherwise the cyanuret of potassium in fusion easily rises into the tube. The reduction is operated by heating over a spirit-lamp. All the arsenites and arseniates, whose bases are not reducible, or are reduced into arseniurets, which lose a portion or the whole of their arsenic by it, furnish metallic mirrors by fusion with cyanuret of potassium. The following compounds of arsenic have furnished us the finest mirrors: arsenious acid, sulphuret of arsenic, the arseniates of potassa, baryta, lime, silver and arsenite of copper. The arseniates of peroxide of iron and lead, did not give mirrors, or gave only imperfect ones. The method of reducing arsenical compounds by cyanuret of potassium, merits particular attention on account of its simplicity, the certainty of its result, even with extremely small quantities of arsenic, and the cleanliness with which it may be executed.

Besides the reductive properties which invest cyanuret of potassium with so high a value, it is endowed with a special action as a simple flux. It appears to us to be advantageous in this respect in the following cases :—

1. *Decomposition of Sulphates of the Alkaline Earths.*—If sulphate of lime, baryta, or strontia be fused with four or five times its weight of the mixture of soda and cyanuret of potassium, sulphate of soda and carbonates of the alkaline earths are obtained by solution in water. The decomposition is operated, therefore, as when pure soda is employed. But the presence of the easily fusible cyanuret of potassium presents this advantage—that there is no need, as with soda, or soda and carbonate of potassa, of a platinum crucible, nor of a strong heat; a porcelain crucible and a spirit-lamp are sufficient. This method, although less convenient for quantitative analysis, is more so for qualitative analysis.

2. *Decomposition of the Compounds of Silicic Acid.*—Cyanuret of potassium acts likewise in this case only as an easily fusible flux, and thus allows of the decomposition of compounds of silicic acid reduced to fine powder (we have made the experiment on sand, glass, &c.) in a porcelain crucible, over a spirit-lamp. This property, in certain circumstances, presents great advantages in qualitative analysis. Five parts of the mixture of soda and cyanuret of potassium are added to one part of the compound of silicic acid.

3. *Separation of Compounds insoluble in Water and the Acids, in Qualitative Analyses.*—In qualitative investigations, we finish, as is known, after the extraction of the substances soluble in water and the acids, by obtaining those which are insoluble in them, such as sulphate of baryta, sulphate of lead and silicic acid. It is known that certain inconveniences attend the separation of these substances, owing partly to the difficulty of completely removing the lead by the humid way, and partly to the almost entire impossibility of obtaining, with a spirit-lamp, the heat necessary for the decomposition by soda, in a porcelain crucible; but at a higher temperature the porcelain crucible is attacked. The mixture of soda and cyanuret of potassium remedies this inconvenience in a very simple manner. If, indeed, the substances mentioned be fused with four or five times the weight of the mixture, the sulphate of lead is reduced, the sulphate of baryta passes to the state of carbonate of baryta, and the silicic acid combines with the alkali. If, then, the whole be treated

with water, the latter is obtained in solution. Acetic acid, poured on the residue, dissolves the carbonate of baryta. The lead in the state of regulus is not dissolved.

After having given in this Memoir the most essential results of our investigations relative to the action of the cyanuret of potassium on other bodies, we think that we may express the conviction, that cyanuret of potassium, on account of the special applications of which it is susceptible, should occupy a distinguished rank among the most important auxiliaries to chemical analysis.

ON THE ACTION OF METALS IN IGNITION ON OLEFIANT GAS.*

BY R. F. MARCHAND.

By exposing olefiant gas to red heat in porcelain tubes, filled with small pieces of porcelain, in order to multiply the points of contact of the gas and the solid body, Marchand obtained a gradual diminution of carbon; there was gradually formed a mixture of marsh gas, $C^1 H^4$, or $C^2 H^8$, and olefiant gas and some charcoal remained in the tube.

In a second series of experiments, the porcelain tubes which the gases were to traverse, were filled with copper wire, and heated to a very strong white heat. The gas, examined at the end of a quarter of an hour, consisted almost solely of marsh gas. It burnt with a dull blue flame, and chlorine absorbed only a very small portion of it in darkness. After a prolonged exposure of the tubes to a strong white heat, almost all the carbon of the gas had disappeared, and little else than pure hydrogen gas was disengaged. Olefiant gas $C^4 H^8$ is decomposed, then, first into $C^2 + C^2 H^8$, then into $C^2 + C^2 + H^8$. The application of this property may be made, especially to aëronautical science, for procuring, at little cost, hydrogen in a state of purity, or nearly so. Indeed, by passing through a tube filled with iron wire, and strongly heated to redness, some of the lighting gas employed at Berlin, and which had a specific gravity of about 0·43, Marchand obtained a gas whose specific gravity was only 0·172. This decomposition was already partly effected in the retorts, in which the lighting gas was obtained by the distillation of coal. Their interior was covered with a more or less thick layer of charcoal. However, it is not only olefiant gas, but also the other carbonised products of the distillation of coal, which are decomposed in the same manner by the red-hot metallic surface, and which give rise to the formation of this layer of charcoal.

The charcoal which is thus deposited in the interior of the retorts possesses some remarkable properties. These properties completely differ, according to whether it immediately touches the sides of the retort, or limits its interior cavity; its specific gravity diminishes internally; in proceeding in this direction, it was found = 2·356—2·056—1·982—1·821—1·723. The highest number almost exactly represents the density of the heaviest graphite. Its specific heat is 0·20360, whilst that of native graphite is 0·20187. Moreover, the compact portion of the graphite of the gas retorts possesses such considerable hardness, that it gives sparks with steel, and can be worked only with emery, and absolutely with the same difficulties as glass.

1. Graphite arising from the most external layer, immediately touching the sides of the retort, gave by analysis 98·38 per cent. of carbon, and 1·72 per cent. of iron, in one case, and 99·80 per cent. of carbon, and 0·20 per cent. of iron, in another. No hydrogen in either case.

2. Graphite from the interior of a layer of $0^{m}\ 0^{41}$ in thickness furnished

97·44	per cent.	C
0·55	,,	H
2·18	,,	ash
100·17		

The ash was formed of peroxide of iron and silicic acid. The latter acid evidently arose from the ash of the coal, which was mechanically mixed, whilst the iron probably existed in the state of carburet of iron in the graphite, and had been transformed into peroxide only by the combustion in the analysis.

This graphite, put in contact with bismuth, antimony, nickel, silver, zinc, copper, or iron, developes a very distinct *thermo-electric action*, but in a decreasing order. This power is not excited after the treatment of the graphite by boiling nitro-hydrochloric acid.

The formation of this charcoal in the gas retorts occurs especially when the temperature of these retorts is raised very high. The latter are naturally very much injured by it, and the quality of the product is impaired.

Copper presents very peculiar phenomena, at a dull red-heat, in a current of olefiant gas. A bright copper wire, of 1½ millim. in thickness, became tarnished and was covered with a very thin layer of a blackish substance, easily removed by friction: its weight had very little increased; the metal had, however, undergone a very essential change in its aggregation; the red color of the copper had disappeared, and was converted into a reddish-white color; its fracture was granular, almost crystalline, and the metal had become extremely brittle and friable. The gas did not contain sulphur.

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* *Journal de Pharmacie*, January, 1843.

This experiment was then modified by employing, instead of the copper wire, metallic copper in powder, obtained by means of the reduction of oxide of copper by hydrogen gas. The surface of the metal was covered in a short time with a black layer, which attained the thickness of several millimetres at the place from which the current of gas came, whilst the layer was only very thin in the opposite place. The charcoal contained so much the more copper as it was less distant from that metal; the most superficial layer presented 4—2, 4 per cent. in two different analyses, whilst that which was immediately in contact with the metal, contained 12—10 per cent.; the charcoal is here combined with copper in the parts distant from the metal, by an inverse phenomenon of cementation.

The formation of carburet of copper, whose existence is doubted by some chemists, and its formation by this way with metallic copper and olefiant gas, is not without interest in analytical chemistry; that is to say, in the analysis of organic compounds by oxide of copper. It is possible, indeed, as Dumas also admits, that when a portion of the oxide of copper has been converted into metallic copper, the volatile hydrocarbons, produced by the elevation of temperature of the organic substance, or the compounds themselves, volatilised without alteration, are decomposed in the same manner as olefiant gas; and that an irreparable loss of carbon is produced by the formation of carburet of copper. It is, doubtless, one of those sources of error, which, in the great number of organic analyses, performed with compounds containing the largest quantities of carbon, so long prevented us from detecting the incorrectness of the composition formerly admitted for carbonic acid. The employment of oxygen naturally enables us to avoid this error, and consequently insures the accuracy of the analyses.

Nickel, palladium and platinum, act in this respect like copper.

Chemists have often observed, in certain platinum crucibles, suspended too low in the flame of the spirit-lamp, in such a manner as to prevent the access of air, and to effect the separation of the unburnt charcoal, that platinum may combine with carbon when gaseous hydrocarbons are brought in contact with its surface, heated to redness. However, it is not here the *separated* carbon, which combines with the platinum; but it is rather the unburnt carburetted hydrogen, which is decomposed in its contact with the red-hot surface of the metal, and whose carbon combines with the latter in the *nascent* state. We see in these cases, black vegetations of carburet of platinum part from the crucible, which are very promptly changed, by combustion in the open air, into spongy platinum. This disagreeable phenomenon is commonly often reproduced in the places where it has already shown itself. It is found advisable sometimes again to burnish these polished places.

Marchand directed a current of olefiant gas through a porcelain tube, strongly heated to redness, containing a platinum wire of 1½ millim. in thickness, of a spiral form. The latter was covered with a thin black layer, which was with difficulty detached by rubbing; it was formed of carburet of platinum, and it left the platinum wire completely corroded, as if it had been steeped in *aqua regia*. A thin wire of $\frac{1}{15}$ millim. in thickness, likewise twisted into the spiral form, and exposed to a strong heat, was speedily covered with a compact carbonaceous layer. The latter, when once the reaction was commenced, increased with astonishing rapidity, and formed a perfectly light layer, but at least thirty times as thick, of carburet of platinum. It finally obstructed almost the whole of the porcelain tube, in such a manner that the current of gas pushed the matter before it. This last burned very easily in the air, and left 11·5 per cent. of platinum, under the form of an extremely fine and loose grey sponge, whose chemical energy greatly exceeds that of ordinary spongy platinum.

ACTION OF POTASSA UPON CHOLESTERINE.*

BY J. LAWRENCE SMITH, M.D. OF CHARLESTOWN, S.C.

For some reasons we would be induced to place cholesterine among the fatty bodies, but, from many of its characters, it would appear certainly not to belong to this class of bodies. The most important distinctions between these two bodies are, first, the want of action of a solution of potassa upon cholesterine; and, secondly, its high point of fusion, which is 298° F.†

Another difference which I am able to point out is, that cholesterine is heavier than water, whereas the fats are lighter. It will be found in works on Chemistry, that cholesterine is lighter than water; and I attribute this to the fact, that the substance, as it crystallises out of alcohol, was found to float on the surface of water; but this is owing to the air adhering to the crystals. To show that it is heavier, all that is necessary to be done is, to throw a small piece of fused cholesterine into a vessel containing water, that must afterwards be made to boil, (this is done to drive away the air adhering to the surface of the body,) after which it will be found to sink, and remain at the bottom of the vessel, even when the water is cold. I dwell thus much upon this, because I feel confident that there are other organic bodies that are said to be lighter than water, but which are actually heavier; for, owing to the looseness of their structure, air insinuates itself between the molecules, and is afterwards held so firmly, that it is impossible to drive it away by the ordinary means. I now return to the first distinguishing character between cholesterine and the fats—the difference of the action of potassa upon the two bodies.

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* *Silliman's American Journal of Science and Arts*, January, 1843.

† The melting point of most of the fats is below 140°.

Chevreul and others have shown, that if cholesterine be digested a great length of time in a boiling solution of potassa, no change takes place; but here the cholesterine is not subjected to the action of potassa under the same circumstances as the fats; for in the case of the latter, the point of fusion being considerably below that of boiling water, the force of aggregation is in a great degree destroyed, and consequently does not oppose itself to the chemical action; whereas in the case of cholesterine, the point of fusion being much higher than that of boiling water, it remained solid, and therefore its force of aggregation opposes itself strongly to the action of potassa, (supposing one to exist). So, then, the difference of the action of a solution of potassa upon these substances, is not such a strong mark of distinction as it would at first sight appear to be, as it is impossible to subject them to this action under similar circumstances.

This fact is mentioned, not to show that cholesterine may be a species of fat—far from it; it is simply to attempt to exhibit, that there is no stronger reason for supposing that cholesterine is not a fat, because a boiling solution of an alkali does not act upon it, than there is for considering spermaceti a fat, because it is acted upon; as here the spermaceti is in a state of fusion, one that is favorable to this action, and the cholesterine solid, a state opposing this action.

In an article on Spermaceti, published in this Journal, volume XLIII. p. 301, I stated my reasons at large for not believing this body to be a fat, properly speaking, and at the same time explained how I supposed an alkali to react upon it; it was there ranked with athal and cholesterine. I then also stated, that although a boiling solution of an alkali might not react upon cholesterine, still I had no doubt that the alkali by itself, aided with a high temperature, would react upon it in a manner similar to that in which it did upon spermaceti. From the kindness of M. Pelouze, who furnished me with a small quantity of cholesterine, I have been able to examine into the truth of this supposition.

The first circumstance necessary to be observed in the examination of this reaction, is to have the cholesterine intimately in contact with potassa; and this is done by rubbing together equal parts of the two substances in a mortar. The mixture was placed in a watch glass, and spread out so as to expose a large surface to the air; the watch glass was placed on a support in a copper vessel; (the air contained in this vessel could be brought to any required temperature;) the experiment being thus disposed, the vessel was heated, and by the time that the air in the interior arrived at 248° Fah., a change began to take place in the mixture, and at 266° Fah., it was of a dark-brown color.

This was now treated with cold ether, which dissolved the unaltered cholesterine, and also a matter of a resinous character, which, when dissolved in alcohol, and the alcohol allowed to evaporate spontaneously, is deposited in the form of little round concretions, entirely devoid of crystalline structure; it is not soluble in any of the alkalis. What remains after the treatment by ether, is of a brown color, and completely soluble in water. If hydrochloric acid be added to the solution, it is decomposed, and a yellowish substance rises to the surface. This substance is soluble in ether, alcohol, potassa, soda and ammonia, as well as their carbonates; it does not crystallise; its alcoholic solution reacts slightly acid upon litmus paper. In fact it is an acid of a resinous character; its combinations with alkalis have the character of soaps. Its silver salt is of a yellow color, but soon becomes black by exposure to the light.

From the small quantity of cholesterine that was at my disposal, I have not been able to obtain sufficient of the acid to examine its composition, but I have no doubt that it is a new one.

If the mixture when heated be not well exposed to the air, very little of this acid is formed, even if we elevate the temperature as high as 300° Fah.; but on the contrary, a considerable quantity of the resin before mentioned (soluble in ether) is formed;

though this is capable of being converted into the acid, by the action of potassa, a high temperature, and free access of air. Thus then it will be seen, that the action of potassa, instead of being a means of showing that spermaceti and cholesterine are two substances of entirely different natures, affords strong evidence of their being similar bodies. Further, the action of potassa upon spermaceti, is to produce athalic acid and athal, the former capable of forming soaps with the alkalis, and the latter of being converted into the former, by an alkali and a high temperature.

The action upon cholesterine is to form an acid (which it is impossible for me as yet to name), and a basic resin; the former forms soaps with alkalis, and the latter, by the action of potassa at a high temperature, is converted into the former. This article is meant as an Appendix to the one on Spermaceti; and as an additional proof of the analogy that exists between that body and cholesterine; they being two of a class of bodies which will no doubt be found to be tolerably numerous, and which class I propose to call *pseudo-gras;* among them may be mentioned spermaceti, cholesterine, athal, ambreine, and probably stearérine, and elaïerine, two fatty substances found in linseed oil, and which M. Chevreul brought to the notice of the Academy of Sciences not long since. This class of bodies would appear to be a link between the fats and resins.

Paris, July 8, 1842.

ON THE INTESTINAL CONCRETIONS OF ANIMALS, KNOWN UNDER THE NAME OF BEZOARS, AND ANALYSIS OF A NEW MINERAL BEZOAR.*

BY M. GUIBOURT.

Since Fourcroy and Vauquelin announced that the most frequent, and the most voluminous, bezoars of animals were formed of ammoniaco-magnesian phosphate, this opinion has experienced so few contradictions, especially as regards the horse species, that it is now generally admitted, that all the intestinal concretions of horses are formed of ammoniaco-magnesian phosphate. It is, therefore, very remarkable, that of five intestinal calculi of animals which I have lately analysed, not one has presented that composition. The first of these calculi, which is attributed to a horse, and which weighed 1088 grammes, is composed of oxalate of lime, containing a small quantity of sulphate of the same base. It is the first time, I think, that an animal bezoar has been found thus composed. A second intestinal calculus, of an herbivorous animal, of the weight of 125 grammes, which had been a long time in my possession, presented exactly the same composition: oxalate of lime mixed with a small quantity of sulphate.

A third bezoar, which was given to me by M. Lassaigne, as being an intestinal calculus from a horse, presented a more complicated composition, but in which the above two salts were likewise found. This calculus was composed of—

Carbonate of lime . . .	43·55
Oxalate of lime	34·30
Sulphate of lime . . .	2·85
Carbonate of magnesia . .	2·34
Fat, yellow matter and chloride of sodium	1·34
Extractive matter . . .	1·17
Ligneous matter, yellow matter, and mucus	13·02
Water	1·43
	100·00

A fourth calculus, designated under the name of *Western bezoar*, (*bézoard occidental*), was found to be formed of phosphate of lime mixed with a little ammoniaco-magnesian phosphate. I did not consider it important to determine its exact proportion, but this bezoar permitted me to make an observation which I consider not devoid of interest.

Fourcroy and Vauquelin admitted, among the animal bezoars, calculi of ammoniaco-magnesian phosphate, of phosphate of magnesia, and of acid-phosphate of lime, sometimes containing a little phosphate of magnesia. The neutral or basic phosphate of lime, whose presence in calculi was, however, much more probable than that of an acid phosphate, was not included in this nomenclature. Vauquelin also added, at a later period, to this classification of calculi, phosphate of lime, which did not prevent Berzelius from remarking, that the existence of calculi of superphosphate of lime was probable.

Now, the following is what happened with me in analysing the fourth bezoar of which I have just spoken. This bezoar, being boiled in water, lost one third of its weight, and formed a solution of acid-phosphate of lime, mixed with a little phosphate of magnesia. It appears from this, that Vauquelin was right in admitting calculi of acid-phosphate of lime; but as, in examining the residue insoluble in water, I found it composed of sesquibasic phosphate, it became certain that the calculus was formed of neutral phosphate, which boiling in water had changed into soluble superphosphate and insoluble subphosphate. I have also proved, by experiment, that neutral and even slightly basic phosphate of lime, as it is always obtained artificially, is decomposed in the same manner in boiling water. Neutral phosphate of magnesia undergoes the same decomposition; the ammoniaco-magnesian phosphate itself, by long boiling in water, loses all its ammonia, and is converted into soluble superphosphate of magnesia and insoluble subphosphate.

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* *Journal de Pharmacie et de Chimie*, February, 1843.

I pass over in silence a fifth kind of bezoar, which I think originally came from Asia, and which I found formed of phosphate of lime, mixed with a small quantity of phosphate of magnesia, both neutral and decomposable by water; and I come to the true Oriental bezoars which Fourcroy and Vauquelin have described under the name of Oriental bezoars, and of which they distinguished two kinds, the green resinous bezoars, and the brown-fawn.

I have had an opportunity of verifying the accuracy of this distinction, and I may be permitted to dwell on this subject, on account of the presence of lithofellic acid in one of the two species, and not in the other.

The first species of resinous bezoars is formed of concentric layers of different shades of green.

Far from presenting any crystalline structure, this bezoar presented the smooth and shining fracture of a piece of resin; it is brittle, of the specific gravity of 1·132, bitter to the taste, and of a vegetable, aromatic odor; it is very fusible, burns with flame, is soluble in alcohol, even without heat; and when the liquor has been heated and concentrated, or when it is sufficiently evaporated, it allows a white and shining matter to crystallise, which was obtained by Fourcroy and Vauquelin, and which Dr. Göbel has named *lithofellic acid*, after having more completely studied its properties.

The second kind of resinous bezoar is of a fawn-color, with concentric layers, and with a resinous fracture like the preceding. Its specific gravity is 1·595; it does not melt over the fire, and is very sparingly soluble in alcohol, even with the aid of heat; however, the cooled alcohol allows a crystalline matter to deposit, which differs from lithofellic acid by being much less soluble in alcohol, and by its insolubility in ammonia, which besides alters its nature, and deprives it of its solubility in alcohol, and its property of crystallising.

The portion of the fawn-colored bezoar which is insoluble in alcohol, is principally composed of that yellow matter, whose existence Thénard has noticed in the biliary calculi of a great number of animals, and in which I have recognised some new properties; but this residue also contains other principles with interesting reactions, which should be verified and profoundly studied, when a large quantity of the first substance can be devoted to the purpose.

As regards the origin of these concretions, the fawn-colored bezoar, of which I have been speaking, appears to me to be identical with those sent, in 1806, by the Shah of Persia to Napoleon, the chemical examination of which was confided to Berthollet. It is probably also the swine-stone (*pierre de porc*) which is mentioned in a great number of works; and besides, the odor which this bezoar exhales when it is cut or powdered,—an odor quite similar to that which is disengaged from a mixture of pig's-blood and sulphuric acid,—comes in support of this supposition.

With regard to the green resinous bezoars, which may now be named *lithofellic bezoars*, it appears to me certain, that these are those of the *œgagre*, and of the goat, *Paseu*, of Persia, described by Kömpfer; and on the occasion of the determination with which Kömpfer endeavors to prove that bezoars almost directly owe their formation and their peculiar qualities to the resinous juices of some vegetables on which goats graze in certain parts of Persia, I have mentioned another fact, which had for a long time shown me that there exists a remarkable relation between the predominating vegetables of a country, and certain secretions produced by the animals which inhabit it. Now, doubtless, nothing can appear more natural; for if it is proved that herbivorous animals do not fabricate the materials of their nutrition, but take them quite formed in vegetables, why do these animals make resins, volatile oils, coloring matters, which are useless or injurious to them, if it is not to deposit them in organs, which at first take them from the circulation, in order afterwards to make them pass out under the form of excretions? Some years ago, I should scarcely have dared to say so; the following is the fact which led me to this train of ideas.

There exist two principal kinds of castoreum: the one coming from Canada and Hudson's Bay, the other from Siberia. These two productions of the same animal have entirely different odor and composition. The castoreum of America possesses an odor which I have found analogous to that of the resin of certain pines, and especially in that of the larch, which is the same as the red pine of Michaux, so abundant in North America, and whose resinous bark is necessarily one of those which serve for the nourishment of the Canada beaver. Is it then astonishing, that the resin, and especially the concentrated aromatic principle, should be found in a humor secreted by the glands which form part of the recto-urethral apparatus of this bezoar? As regards the castoreum of Siberia, it possesses a strong odor of Russia leather, which is no other than the odor of the oil obtained by heat from the bark of the birch, and this tree is one of those which grow more to the north in the ancient continent, from Norway to Kamstchatka. Let it be remarked, moreover, that carbonate of lime is one of the principal constituents of the bark of the birch, and that the carbonate of lime, which does not exist in the castoreum of Canada, forms from one fourth to one third of that of Siberia; and it will be evident that the difference of the two secretions is owing only to that of the barks, whose elements produce them. The same diversity of odor and quality of tonquin musks and *Kabardins*, can be explained only by that of the vegetables on which the musk animal feeds.

The Memoir which I have the honour of laying before the Academy, concludes with the analysis of a mineral bezoar, which formed part of the collection of rocks, formed by M. Pelletier. Now, whilst the most modern authors mention these kinds of concretion, only to assimilate them to pisiform carbonate of lime, that which I have just analysed is composed of sesquibasic phosphate of lime, combined with six atoms of water, and which constitutes a new mineral species, for which I propose the name of *Pelletierite*, as a tribute to the memory of the *savant* who is regretted equally by the Institute of France, and the *Ecole de Pharmacie de Paris.*

ON THE ARTIFICIAL PREPARATION OF LAUREL CAMPHOR.*

BY F. ROCHLEDER.

THE camphorated odor of certain essential oils, led the author to ascertain whether their conversion into camphor, by the action of the oxygen of the air, was not the cause of this odor, and, in this event, there was reason to expect that this conversion might also be produced by other oxydising substances.

In this respect, the neutral non-oxygenous essential oils, which contain, as is known, carbon and hydrogen in the same atomic proportion as camphor, appeared to him the most proper for a conversion of this nature.

Oil of valerian, as obtained by the distillation of the roots of this plant, is a mixture of two different bodies, one of which is free from oxygen, and isomeric with oil of turpentine. We are indebted to Ettling's researches for our knowledge concerning this body.

A long time ago, M. Bonastre examined the action of nitric acid on impure oil of valerian; he announced that it at first assumes a blue color under the influence of that acid, and that it gives oxalic acid by continuation of the heat. Rochleder has found, by repeating the experiments of M. Bonastre, that the impure oil, put in contact with nitric acid, at first takes a blue color, which afterwards turns to yellow, and that it at the same time acquires more consistence; nitrous vapors are abundantly developed.

If the heat be continued, there passes over by distillation with the nitric acid, an oil which is solidified by agitation with a large quantity of water, and which presents the characters of nitrate of camphor.

The camphor thus obtained with the impure oil, is accompanied by products due to the action of nitric acid on the oxygenous principle of oil of valerian, namely, a volatile body which provokes tears, and a yellow body forming a red solution with potassa, less volatile. There remains a yellow viscid resin, with an aromatic odor, which partially dissolves in nitric acid with a yellow-red color, and may be precipitated from it by the addition of water. The author was never able to discover oxalic acid in it.

To purify the camphor thus obtained, it must be washed with an aqueous solution of potassa, and freed, by pressure between folds of blotting paper, from the coloring matter which adheres to it; it is then distilled over an extremely concentrated solution of potassa, and dissolved in strong alcohol. It is precipitated from this solution by water; it is afterwards dried by pressure between folds of blotting paper, and is mixed with the powder of recently fused chloride of calcium, and is submitted to sublimation.

If impure oil of valerian mixed with a solution of potassa be distilled, and if the neutral oil thus obtained be employed in the preparation of camphor, the above-mentioned accompanying products are not formed, with the exception of an insignificant quantity of a yellow resin, which remains in the nitric acid after the distillation of the nitrate of camphor.

The camphor thus obtained and purified is formed of—

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* *Annalen der Chemie und Pharmacie.*

10 At. Carbon	758·540	79·15	78·84
16 ,, Hydrogen	99·836	10·42	10·44
1 ,, Oxygen	100·000	10·43	10·72
	958·376	100·00	100·00

The neutral oil of valerian = $C^{10} H^{14}$ requires only 1 at. of oxygen for its conversion into camphor; this is furnished to it by nitric acid. The camphor* formed in this manner combines with an excess of nitric acid, forming nitrate of camphor, which, put in contact with water, is decomposed into camphor and dilute nitric acid. Ettling had previously arrived at the same results.

Oil of turpentine, submitted to the same treatment, gave no trace of camphor among the products of the oxidation.

Oil of sage, whose odor is similar to that of camphor, was oxidised by nitric acid, and a considerable quantity of that substance was formed. In order to explain its production by the essential oil of sage,—a production which had not hitherto been the subject of any investigation,—it was necessary to ascertain the composition of this oil.

If the essential oil of the *Salvia officinalis* be distilled in a retort placed in an oil-bath, whose temperature is maintained between 130° and 140° C., and if the distilled oil be fractioned in several portions, several oils are obtained differing in their odor and volatility, but which, as regards their composition, all contain carbon and hydrogen in the same atomic proportion.

These different oils gave, by analysis, results answering to the formulæ $C^{12} H^{20}$, $C^{18} H^{30} O^2$, $C^{30} H^{50}$. It is therefore evident that, in all these bodies, the number of the atoms of carbon is to that of the atoms of hydrogen as 6 to 10, and that the proportion of oxygen alone varies. It increases with the age of the oil.

By distilling oil of sage over a more or less considerable quantity of hydrate of potassa, oils are obtained, whose composition may be expressed by the formulæ, $C^{22} H^{40} O$, $C^{30} H^{50} O$, $C^{60} H^{100} O^3$. If the distillation be pushed very far, we obtain, in the receiver, an oil of a strong, burning odor, resembling at once that of sage and that of mint, with a simultaneous disengagement of hydrogen, and formation of carbonate of potassa: it is composed according to the formula $C^{22} H^{40} O^2$. This composition is equal to that of oil of sage, $C^{24} H^{40} O^2$ minus 2 atoms of carbon, which, forming carbonic acid with the oxygen of the water of the hydrate of potassa,

$$\begin{array}{ll} C^{24} H^{40} O^2 & \\ -C^2 & +O^4 \\ \hline =C^{22} H^{40} O^2 & +2CO^2 \end{array}$$

If oil of sage, whose composition, according to the results of analysis, may be expressed by $C^6 H^{10}$ plus a variable quantity of oxygen, be put in contact with cold and concentrated nitric acid, or else hot and not concentrated, it is colored of a red-brown, and if the temperature be much raised, a great quantity of gas is disengaged, and the oil is converted into a red, resinous mass. This red and viscid resinous mass is formed of a yellow resin, soluble in solution of potassa, with a red color, of oil which has undergone little alteration, and of nitrate of camphor. By dissolving this mass with water, a camphor is obtained, mixed with an oil of a peculiar odor, and a yellowish-red, brittle resin.

If, on the contrary, concentrated fuming nitric acid be heated to boiling, in a large vessel, and if oil of sage be added by drops, there is a considerable elevation of temperature, and an abundant disengagement of gas.

This gas, collected over water, and washed with that liquid, then put in contact with lime-water over mercury, renders it turbid, and causes an abundant precipitate of carbonate of lime; deutoxide of nitrogen remains.

The oil is for the most part dissolved in nitric acid, and colors it of a yellow-red. If this solution be mixed with four times its volume of water, and if the milky liquor formed be boiled, camphor is deposited on the sides of a cooled tube, through which the vapor is passed. The same process is followed for its purification, as for that of the camphor of oil of valerian. It is composed of $C^{10} H^{16} O$.

Its production by oil of sage, under the influence of nitric acid, with a simultaneous disengagement of carbonic and nitrous acids, is very easily explained, by comparing the proportion of the number of atoms of carbon and hydrogen, in the oil of sage, with that of camphor:—

Carbon and hydrogen of the oil of sage	$C^{12} H^{20}$
Carbon and hydrogen of camphor	$-C^{10} H^{16}$
	$C^2 H^4$

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* Gerhardt has announced that he has succeeded, by treating the neutral oil of valerian with hydrate of potassa, in obtaining the camphor of the *Dryobalanops camphora*, and in converting it into camphor of *Laurus camphora*, as M. Pelouze has long since indicated. *See* THE CHEMIST, Vol. I. No. XI.

There remain 2 atoms of carbon and 4 atoms of hydrogen, which form carbonic acid and water, by their combination with the oxygen of the nitric acid, and there is a disengagement of nitrous acid.

The camphor produced combines with the excess of nitric acid, forming nitrate of camphor.

ON THE MEANS OF DETECTING THE PRESENCE OF SULPHUROUS ACID IN COMMERCIAL PRODUCTS.*

BY MM. FORDOS AND GELIS.

The odor of sulphurous acid is so characteristic, that it may appear superfluous to bring forward new means of detecting its presence; but without repeating all that has been said against reagents whose accuracy has no other limits than the greater or less sensibility of the smell, we may observe that this character, excellent as it may be in certain cases to guide the experimentalist, is perfectly powerless if the sulphurous acid is mixed with matters themselves possessing odors.

The presence of sulphurous acid in some products employed, either in medicine or in the arts, often carries with it inconveniences sufficiently great to render it desirable to possess easy means for detecting and avoiding it. In 1836, M. Girardin furnished to industry a means of detecting the presence of sulphurous acid in the hydrochloric acid of commerce.

This process is easy of execution. About sixteen grammes of the acid to be tested are put into a test-glass; from eight to twelve grammes of salt of tin, very white and unaltered by the air, are added to it; it is stirred, then two or three times its quantity of distilled water must be added, stirring all the time. If the hydrochloric acid contains sulphurous acid in rather large quantity, immediately after the addition of the salt of tin the acid is seen to become turbid, and to turn yellow, and as soon as distilled water is added, the odor of hydrosulphuric acid is manifestly perceived; the liquor assumes a brown tint, depositing a powder of the same color.

This process, which is an application of a reaction formerly pointed out by B. Pelletier, and since studied by M. Hering, is generally regarded as very convenient. Indeed, it is sufficient for the wants of the greater number of manufacturers, who have only to guard against too considerable quantities of sulphurous acid. But chemists are less favored; for this process, which, as its author himself stated, can detect only about $\frac{1}{100}$th of this gas, is no longer applicable, even where very small quantities of sulphurous acid may be injurious to the operations. This is the case with hydrochloric acid intended for medical use, or for scientific investigations; for example, when it is desired to employ it in toxicological experiments, or in the preparation of gaseous waters.

We have therefore thought that it would be useful to bring forward a more delicate analytical process, and one at the same time as easy of execution. Last year, we conceived the idea of turning to account with this object, the curious reaction which we had just discovered, and which is produced whenever sulphurous acid is brought in contact with nascent hydrogen; in this note, it will be sufficient to indicate the *modus operandi*, and the experiments which we have since made, for determining the sensibility of this new analytical process.

In presence of nascent hydrogen, arising from metals of the third section of M. Thénard, the reduction of the sulphurous acid is inevitable, however small its quantity; hydrosulphuric acid is always formed, and the action of this body on the salts of lead is so characteristic, that it can detect the presence of truly incredible traces of this gas. The mode of operating does not present any difficulty: small pieces of pure zinc are introduced into a small flask; the substance to be examined is afterwards added; if it is an acid capable of furnishing hydrogen with zinc, it is sufficient to collect the gas which is disengaged, in a solution of subacetate of lead; if he substance is not acid, it is first mixed with sulphuric acid diluted with four or five times its bulk of water, then the mixture is poured into the phial, and the gas is collected in the same manner in a solution of acetate of lead. The most simple apparatus is sufficient for this: a little straight neck and a bent tube; if the matter contains sulphurous acid, hydrosulphuric acid is formed, and afterwards sulphuret of lead; this body is so insoluble in acetate of lead, that the slightest trace is sufficient for coloring it.

In order to give an idea of the delicacy of this process, a solution of sulphurous acid in water, containing exactly its volume of gas, was prepared. It required from 45 to 50 drops of this solution, mixed with 15 grammes of hydrochloric acid, to obtain the reactions indicated by M. Girardin, whilst a single drop of this mixture, containing $\frac{1}{8}$ of a cubic centimetre of sulphurous acid gas, mixed with 10 grammes of acid diluted with water, also gave in the acetate of lead a very visible coloration.

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* *Journal de Pharmacie et de Chimie,* February, 1843.

This process is so much the more valuable, in a qualitative point of view, as it may be used for ascertaining the presence of sulphurous acid, whatever may be its state of dilution; but it will not be of any assistance in quantitative analysis, except for very small quantities, because when sulphurous acid exists in the liquors examined in concentrated solution, a deposit of sulphur is always the first effect of the contact of the two gases, and always accompanies the disengagement of hydrosulphuric acid.

We have heard pointed out in lectures, as probably being a very easy method of estimating a gaseous mixture of sulphurous acid and hydrochloric acid, the following manipulation:—A quantity of water, sufficient for absorbing the two gases, is driven into the bell-glass which contains the mixture. A few grammes of divided iron are introduced into this solution, and the following takes place. The sulphurous acid dissolves the iron without any disengagement of gas: Berthollet was the first to show this in 1789: the hydrochloric acid, on the contrary, forms chloride of iron, abandoning its hydrogen, which may be measured; it is known that hydrochloric acid contains half its volume of hydrogen; by doubling the volume obtained, we shall have the primitive volume of the hydrochloric acid, and by the difference, that of the sulphurous acid. But instead of the results announced as probable, quite different ones are obtained. Thus, when we operate in certain proportions—for example:—

55 volumes of hydrochloric acid gas
18 ,, sulphurous ,,

no gas is disengaged; protochloride of iron is formed and dissolved in the liquor; sulphur is deposited, and at the end of a short time, combines with the excess of iron contained in the bell-glass.

Our work on the reduction of sulphurous acid in Marsh's apparatus, &c., rendered this result probable. Indeed, the hydrogen, instead of being disengaged, reacted on a portion of the sulphurous acid to form hydrosulphuric acid, and this hydrosulphuric acid reacting in its turn on another portion of sulphurous acid, gives the deposit of sulphur which we have observed.

The process which forms the subject of this note, detects, in a certain manner, the presence or absence of sulphurous acid; but it cannot point out whether this acid pre-existed in the matter examined, or whether it has been formed by the decomposition of another oxygenous compound of sulphur. These indications will require recourse to more complicated means, which will form the subject of another communication.

PREPARATION OF OXALIC ACID.*

BY SCHLESINGER.

THE following, according to Schlesinger, is the most advantageous process for preparing oxalic acid.

To 1 part of sugar dried at 100° C., add 8·25 of nitric acid, sp. gr. 1·38; evaporate to one sixth, and crystallise the mixture submitted to ebullition. The whole operation is terminated in from one to two hours; between 58 and 60 per cent. of oxalic acid is obtained in fine crystals.

NEW ORGANIC ACIDS CONTAINING CHROME.*

BY M. MALAGUTI.

IN a letter to M. Dumas, M. Malaguti says—My work on the chrome acids is advancing, and may be summed up in two propositions:

1. Oxide of chrome, and probably all the oxides of the same formula, in combining with organic acids, can give rise to compounds which, far from being salts, are true acids.

2. Oxide of chrome, in combining in the nascent state with certain organic acids, under the influence of disoxygenising actions, may take the place of 4 eqs. of hydrogen, eliminated.

The following are examples in support of these two propositions:—

Bichromate of potassa and oxalic acid, $C^8 O^{12} Cr^2 O^3 + K O + 8 H O =$ chromoxalate of potassa;

Bichromate of potassa and citric acid, $C^{12} H^{12} O^{12} Cr^2 O^3 + K O + 3 H O =$ chromocitrate of potassa;

Bichromate of potassa and tartaric acid, $C^8 H^{10} Cr^2 O^3 + K O + 7 H O =$ chromo-tartrate of potassa;

Bichromate of potassa and mucic acid, $C^{12} H^8 O^{14} Cr^2 O^3 + KO + 7 H O =$ chromomucate of potassa.

All the new salts, submitted to double decompositions, exchange their bases for new bases; but the oxide of chrome and the acid are inseparable, and may be isolated with the properties common to acids.

If I am not deceived, the very positive fact, that a molecule of oxide of chrome replaces four molecules of hydrogen, appears to indicate that the equivalent of chrome is double that which is ordinarily admitted, and that, consequently, the formula of oxide of chrome is $Cr O^3$, and that of chromic acid $Cr O^6$. If it is thus, the peroxide of iron becomes $Fe O^3$, and, consequently, the protoxide of iron becomes $Fe O^2$, and all the oxides isomorphous with oxide of iron change their formula in the same case.

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* *Comptes Rendus*, No. 8, Feb. 1843.

In my first proposition, I suppose that the oxides of the same formula as oxide of chrome partake with the latter the same properties. This idea was suggested to me by the reactions of emetic of antimony, and of emetic of iron, which greatly resemble the actions of my chromosalts. Indeed, you have yourself prepared, by double decomposition, the emetic of lead and the emetic of silver; and for that purpose, you have replaced the base of emetic by another base, without touching the oxide of antimony. When an acid is poured on emetic of iron, tartrate of iron is precipitated, which, acting the part of an acid, is driven from these combinations by a stronger acid; the emetic of antimony acts in nearly the same manner.

It seems to me, that in considering the emetic of antimony as a stibio-tartrate, satisfactory light is thrown on the constitution of emetics. The emetics of arsenic, boron, iron, &c. become boro-tartrates, arsenio-tartrates, and ferro-tartrates.

I have prepared the emetic of chrome by saturating cream of tartar by oxide of chrome. I obtained a salt which greatly resembles my chromo-tartrate of potassa; but it differs from it, in that, projected on burning coals, it spreads the odor belonging to the tartrates in combustion, whilst the chromo-tartrate of potassa does not give out this odor. This is a natural difference, for the chromo-tartrate above mentioned contains 4 eqs. of hydrogen less than the emetic of chrome.

In working my chromosalts, I have found very elegant processes for preparing products difficult to obtain by known processes.

By saturating binoxalate of potassa by oxide of chromium, the beautiful blue salt discovered by Gregory was obtained:—

$$3\overline{Ox^2}\ K\,O + Cr^2\ O^3 + 6H\ O = (\overline{Ox^3}\ Cr^2\ O^3\ 3Ox\ K\ O + 6H\ O) = \text{Gregory's salt.}$$

By saturating quadroxalate of potassa by oxide of chromium, chrome oxalate of potassa is obtained:—

$$\overline{Ox^4}\ K\ O + Cr^2\ O^3 + 8H\ O = (\overline{Ox^4}\ Cr^2\ O^3, K\,O, 8H\ O).$$

By saturating with sulphurous gas a solution of bichromate of potassa, and by pouring on this solution sulphuric acid until effervescence takes place, chrome alum is obtained by spontaneous evaporation.

THE COMPOSITION AND PRODUCTS OF DISTILLATION OF SPERMACETI, WITH SOME FEW REMARKS UPON ITS OXIDATION BY NITRIC ACID.*

BY J. LAWRENCE SMITH, M.D. OF CHARLESTON, S. C.

Of all the fatty bodies that have been examined, there is perhaps no one whose composition has been so imperfectly arrived at as that of spermaceti, and it is a little remarkable that Chevreul, with the accuracy which distinguishes his researches upon the fats, should not have ascertained more nearly its true composition.

Chevreul made the examination of spermaceti in the same way as he did that of other fatty bodies, by digesting it with a solution of an alkali, and examining the products that combined with the alkali, and those that did not. In the case of *spermaceti*, he obtained a solid substance that did not combine with either *soda* or *potash*, resembling strongly in its external characters the fats, and upon analysis with binoxide of copper, gave—

Carbon . . .	79·76
Hydrogen . . .	13·95
Oxygen . . .	6·29
	100·00

From this he calculated its formula ($C_{32}\ H_{33}\ O + H\ O$), and this substance he called, from some peculiarities in its composition, when compared with that of alcohol and of ether, athal, or rather hydrated athal. That part of the spermaceti which combined with potassa, Chevreul considered to be composed of margaric and oleïc acids, without apparently any strong grounds for so doing; he gives us no analyses of these acids, and the following is all that is said concerning them.

"The margaric acid of spermaceti is fusible at 131° to 132° Fah., crystallises in little radiating needles, is insipid and inodorous; at 140° Fah., it dissolves in all proportions in alcohol of ·820, the solution strongly reddening litmus.

"I treated the margarate of potassa with alcohol, to see if I could obtain margaric acid fusible at 140° Fah. I submitted a portion of the same salt to five successive treatments, and obtained first a portion of the salt, whose acid was fusible at 113° Fah., and second, a portion whose acid was fusible at 132° Fah.; this last portion, treated again six times with alcohol, gave first an acid fusible at 131° Fah., and secondly, an acid fusible at 122° Fah.; from this I conclude that it is margaric and not stearic acid which manifests itself in the saponification of spermaceti."

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* Communicated by the Author, to the Editors of the *American Journal of Medical Science and Arts*, October, 1842.

Chevreul gave the following analysis of the salts of this acid, to which I have affixed the atomic weight of the acid that each indicates, and which differ considerably one from the other.

Salt.			Atomic Weight of Acid.
Potassa salt .	Acid	100·0	265·12
	Base	9·8	
Baryta salt .	Acid	100·0	275·36
	Base	2·78	
Strontia salt	Acid	100·00	255·52
	Base	20·26	
Lead salt, bibasic .	Acid	100·00	262·40
	Base	85·00	

What was considered to be oleïc acid, could not be entirely separated from the supposed margaric acid, and consequently it was impossible for Chevreul to study accurately its properties. The elementary analysis of spermaceti, according to Chevreul, is—

Carbon	81·66
Hydrogen	12·86
Oxygen	5·48
	100·00

Dumas and Peligot, considering the base of spermaceti to be athal, and its acids margaric and oleïc, have proposed the following formula :—

Spermaceti.	2 ats. margarate of athal . .	2 ats. margaric acid .	$(C_{34}\ H_{32}\ O_3)\ 2$	$C_{208}\ H_{205}\ O_{14}$ *
		2 ats. athal . . .	$(C_{32}\ H_{33}\ O\ )\ 2$	
	2 ats. oleate of athal	1 at. oleïc acid . .	$(C_{44}\ H_{39}\ O_4)$	
		1 at. athal . . .	$(C_{33}\ H_{33}\ O\ )$	
		1 at. water . . .	$(\ \ H\ \ O\ )$	

The athal here mentioned as the base, is now considered as composed of a substance called *cetyl*, or *cetin*, and water. This cetyl or cetin is obtained from athal by the action of anhydrous phosphoric acid; it is a substance of an oily nature, and consists of equal equivalents of carbon and hydrogen.

1 at. cetin	$C_{32}\ H_{32}$
1 at. water	$H\ \ O$
1 at. anhydrous athal .	$C_{32}\ H_{33}\ O$
1 at. water . . .	$H\ \ O$
1 at. hydrated athal .	$C_{32}\ H_{34}\ O_2$

Taking cetin as being the probable base of spermaceti, Dumas has also proposed the following formula :—

Spermaceti.	2 ats. margarate of cetin	2 ats. margaric acid .	$(C_{34}\ H_{33}\ O_3)$	$C_{208}\ H_{204}\ O_{13}$
		2 ats. cetin . . .	$(C_{32}\ H_{32}\ \ )$	
		2 ats. water . . .	$(\ \ H\ \ O\ )$	
	1 at. oleate of cetin	1 at. oleïc acid . .	$(C_{44}\ H_{39}\ O_4)$	
		1 at. cetin . . .	$(C_{32}\ H_{32}\ \ )$	
		1 at. water . . .	$(\ \ H\ \ O\ )$	

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* The formula for margaric and oleïc acids are those that have lately been given by Varrentrapp.

But it will be seen that neither the percentage indicated by this, nor by the last formula, agrees with Chevreul's analysis of spermaceti :—

208 atoms carbon . .	1272*	80·06
205 ,, hydrogen .	205	12·90
14 ,, oxygen .	112	7·04
	1589	100·00

208 atoms carbon . .	1272	80·51
204 ,, hydrogen .	204	12·95
13 ,, oxygen . .	104	6·54
	1580	100·00

Analysis of Spermaceti,
by Chevreul.

Carbon . . .	81·66
Hydrogen . .	12·86
Oxygen . . .	5·48
	100·00

What has been stated thus far, is a short account of all that was known concerning the nature and composition of spermaceti, previous to my attention being attracted to this subject; and what follows is a detail of my investigations.

Having undertaken some experiments, at the suggestion of Professor Liebig, to examine the products afforded by the distillation of spermaceti, I arrived at certain results, which led me to believe that the composition of this body was not properly made out, and therefore I undertook an examination of it, after the most recent methods for the investigation of fatty bodies.

The examination was directed to two points in particular: first, to the ascertaining whether *spermaceti contained oleïc acid;* and secondly, whether *the solid acid obtained by Chevreul in his researches upon this body was margaric acid.*

The *saponification of the spermaceti* being the first step necessary in this examination, it was of some importance to make use of that method which would bring about the change the most easily. Chevreul digested the spermaceti with a strong solution of potassa for a number of days to effect this change; but Dumas, in speaking of the easiest manner of obtaining athal from it, recommends that it should be saponified by fusing it with one half its weight of potassa; and as by this latter means the process is completed in about one hour, it seemed to me the most preferable, and was consequently adopted.

Two ounces of spermaceti were fused with one half its weight of powdered potassa, care being taken that the temperature did not rise above 230° Fah.; the mass soon became solid; it was then allowed to cool, and afterwards treated with boiling water, which dissolved that portion of it which consisted of the acids, arising from the saponification in combination with potassa; the other portion, consisting of athal and undecomposed spermaceti, was held in suspension. To the fused mass, treated as just mentioned with boiling water, was added hydrochloric acid, which decomposed the soap in solution, and liberated the acid which it contained; and this acid being fusible at a temperature much below that of boiling water, melted and arose to the surface along with the athal and undecomposed spermaceti. This mixture upon cooling was again fused with pulverised potassa, for the purpose of acting upon that part of the spermaceti which was not yet decomposed. After this second fusion it was again dissolved in hot water, which solution, holding athal in suspension, was treated with a solution of chloride of calcium, and by double decomposition a combination of the acids resulting from the saponification of spermaceti and lime mixed with athal was obtained.

The water was filtered away from the mixture of the lime, salt and athal, and the mass being dried, was treated with warm alcohol of ·820, which dissolved the athal, and by repeatedly washing the lime salt upon a filter with warm alcohol, and lastly with ether, until the liquid that passed through gave upon evaporation no residue, it was obtained perfectly free from athal. By this process, a small portion of the lime salt is dissolved, which can subsequently be obtained by treating the athal, from which the alcohol had been evaporated, with ether, which leaves undissolved the lime salt, and this is added to what remains upon the filter.

The lime salt was dried, and decomposed by dilute hydrochloric acid, which furnished me with the acids arising from the saponification, and, like most of the fat acids, it floats about the water in flakes, which melt and collect at the surface, if the water be heated.

Having now the acids free from undecomposed spermaceti and athal, the first part of the examination, that is to say, the examination for oleïc acid, was carried on as follows.

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* The atomic weight here taken for carbon is that of Berzelius (6·115), as Chevreul's calculation is made with the same.

(*To be continued in our next.*)

ON THE STATE OF THE ALKALI IN THE BLOOD.

BY CHARLES WATT, JUN.

It must be matter of some surprise to the chemical philosopher, that the state of the alkali in the blood has never been ascertained by direct experiment; but far more astonishing are the opinions on this subject advanced by Dr. John Davy and M. Denis. The existence of free carbonic acid has been frequently and clearly proved; but Dr. J. Davy, *assuming*, for some reason which one is at a loss to discover, that the alkali is in an uncombined state, denies the presence of a body (carbonic acid) which numerous experiments have proved to be there; but he gives us no proof of the alkali being free. M. Denis, speaking of the alkali in the blood, says: "Now, it is positively under the caustic form that it exists in this fluid."

This being the state of the subject, it was my desire to prove, by direct experiment, the actual state in which the alkali existed; for this purpose I procured some freshly drawn blood, both from human beings and from animals, and separated the serum from the fibrin, &c., by raising it to the boiling temperature (taking care to exclude the air), and filtration through a piece of linen rag. This filtered liquor, being treated by acetate of baryta, yielded a precipitate partly composed of carbonate of baryta, which was proved by simply washing and drying the precipitate, and adding a little acid to it, when effervescence took place, and the eliminated gas being conducted by means of a proper apparatus into lime-water, caused the deposition of carbonate of lime.

It is very easy to see how it is that the above-named chemists obtained some caustic soda, which, doubtless, they really did. They evaporated the serum to dryness, and incinerated the residuum; tne carbon contained by the organic constituents of which, at the temperature employed, was sufficient to cause the partial decomposition of the alkaline carbonate, and, consequently, leave some free soda.

There is very little doubt that carbonic acid being present in the blood, the soda is in the state of bicarbonate.

In conclusion, I may add, that we must never expect (or if we do we shall not obtain it) accuracy in the examination of residual salts; *i. e.*, correct information as to the state in which they existed naturally, when they have been exposed to red heat in contact with carbonaceous matters.

COMPOSITION OF THE MUSCULAR FLESH OF DIFFERENT ANIMALS.

BY DR. SCHLOSSBERGER.

Dr. S. examined the flesh of the ox, the calf, the hog, the sheep, the buck (of 3½ weeks old), the roe, the hen, a young pigeon, a very young duck, the barbel, the trout, and the crayfish. All contained fibrine, cellular tissue, liquid albumen, animal matters soluble in alcohol, extractive matter soluble in water only, salts, and, while fresh, more or less free lactic acid. The albuminous coagulum varied according to the quantity of intermixed blood; in the younger animals being less colored. It was formed more speedily in the flesh of the fish and the crayfish, and invariably yielded, by incineration, phosphorus, sulphur, and iron. The pigment was entirely absent in most fishes, and had a more fatty or resinous character in the crayfish. The hæmatosine, whenever found, was always the same. The quantity of contained blood increased with the age, and appeared to be in inverse ratio with the water, but in direct ratio with the contained fibrine. All the kinds of flesh contained osmazome. This was a brownish-yellow, non-gelatinous extractive matter, having an aromatic odor and an acrid taste, and being soluble in water and alcohol. It increased with the age and with the height of the animal in the scale of organisation. The fibrin was every where the same.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

ON COPAL.*

This resin is found upon the coast of Africa. There are no trees in the vicinity, nor any thing to indicate that there ever were any. It is found a few inches below the surface of the ground, in beds resembling lava. The natives who gather it can give no account of its origin. When taken from the bed, the gum is covered with a black earthy substance, which nothing can remove but the strongest lye. As the only establishment known to exist for cleansing it is at Salem, Massachusetts, all the gum brought to this country is sent there. It is placed in vast vats, into which strong lye is poured, and after remaining there some days, it is removed, spread upon boards, and dried in the sun. The action of a stiff brush then removes the coating, and renders it fit for use. It is then assorted, the clear (which is the first quality) separated from the dark and spotted; and it is then packed in boxes, and sent to all parts of the world.

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* *Silliman's American Journal of Science and Arts*, January, 1843.

By removing the native coating, the gum is left with a pale gold color. But by cutting with a knife through the second coating, a brilliant surface is presented, that nearly equals the brilliancy of precious stones. In many pieces of gum insects are found, large, perfect, and beautiful; also fluids, some transparent, some colored.

COLORING PHOTOGRAPHIC PICTURES.*

BY M. LECHI.

M. Arago has presented to the *Academy of Sciences*, in the name of M. Lechi, some photographic pictures, colored after being formed. This coloring is effected in a very simple manner: it consists in depositing successive uniform layers of color on each part of the picture, which is removed, almost immediately afterwards, by passing the plate through hot water.

What remains of the color after this ablution does not seem in the least to injure the appearance or alter the form of the image. The effect is different from that obtained by coloring an image upon paper, in which, if a uniform layer of color be put on those parts where the tone of color is the same, it will always be seen that the shadows have, at first, been black. In the specimens presented by M. Lechi, the shadows, on the contrary, seem to result from the application of several layers of the same color. Thus it seems, that those parts of the picture which were at first black, retain, after being washed, a larger proportion of coloring matter than the lighter parts.

ON MANURES AND THEIR COMPARATIVE VALUES.†

BY MM. BOUSSINGAULT AND PAYEN.

(*Continued from page* 124.)

In Great Britain, goëmon is collected at periods fixed by law; its first products, those thrown up by the waves, are left to the poor. The greater part of the gathering is effected by means of a kind of cutting rake; the plants cut on the rocks, heaped up on rafts, or in lighters, are brought ashore; the agriculturists who devote themselves to this work, sell the surplus of the goëmon useful for their manuring: a great number of lightermen make a trade of it in the department of Manche, in the isles of Chansey, and on the coast from Genests to beyond Cape la Hogue, as well as on the coasts of Calvados, where similar practices are carried on.

Goëmon employed in the normal state is buried as fresh as possible; but for soils in which the employment of decayed manures is preferred, the manures are prepared by making alternate layers of goëmon and dung. A great number of shells, corallines, &c., attached to the fucus, lend their aid to the beneficial effects of this manure; sometimes the goëmon is submitted to an incomplete incineration, which, destroying a great portion of the vegetable substance, leaves in the carbonaceous ash an appreciable quantity of nitrogenous products, as is shown by our analysis. Before burning the goëmon, it is allowed to remain exposed to the rain, in order to remove the excess of salt; it is then frequently turned, in order to dry it. In this state it serves as fuel in localities were wood is scarce.

One advantage of goëmon has been justly noticed, which is, that, not retaining, like dung, the seeds of different injurious plants, it cannot propagate them; on the contrary, it admits of their being diminished, if the seeds confided to the earth be properly refined or chosen.*

The roots of trefoil, buried residues of improving crops, are equal in their dry substance to 0·9 of the substance of dung, and in the normal state to four times their weight of humid dung.

The husks (*radicelles*) of barley, known among brewers by the name of "grains" (*touraillons*), were some time since rejected as valueless for manure; the recent scientific data concerning the composition of the husks, and the appreciation of manures, have opened a market for them among agriculturists. Immediately after being dried in the malt-kilns, they represent twice-and-a-half their weight of ordinary dung, and are sold in several localities at a price corresponding with this strength. Their state of division allows of their being spread economically and with regularity; they absorb and retain the water; they may often advantageously be charged with nitrogenous liquids arising from animal dejections.

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* *Newton's London Journal and Repertory of Arts*, March, 1843.

† *Annales de Chimie et de Physique.*

* Further information concerning goëmon and sea sand, applied as manure, will be found in the *Recherches pour servir à l'Histoire Naturelle du Littoral de la France*, by MM. Audouin and Milne Edwards; 1832; vol. I. pp. 63, 217 and 218, and in a Memoir by M. De Blois, printed in 1823 at Morlaix, by decision of the General Council. We are indebted for the samples and various data relative to the manures of Britain, to M. Augustin, Member and Secretary of the Society of Agriculture of Morlaix.

The seeds collected about the period of maturity, combine a great portion of the nitrogenous principles of the plant; they also furnish very rich manures, from which in several circumstances benefit is derived: it is thus that in Tuscany the lupin is expressly cultivated in certain lands, from which abundant crops could not be advantageously raised. The seed of this leguminous plant is sold for manure: it is employed after having destroyed its germinative faculty by boiling in water, or by slight roasting in an oven. It is evidently a means of importing, near centres of great consumption, an agent of fertility derived from soils less favorably situated.

The seeds of the lupin are used for manure in annual cultures, and in the planting of trees. The table shows, that in the normal state they are worth more than eight-and-a-half times their weight of dung.

Certain residues of manufacture are of great importance in agriculture, for they yield to the manure a considerable quantity of nitrogenous substance. This is the case with many seeds or their residues; thus the residue of grapes, spread directly, or submitted to spontaneous maceration from one season to the other, retains, especially in the stones, a nitrogenous matter sufficiently abundant for this residue, in the normal state, to be equal to about four-and-a-half times its weight of dung; and, as its decomposition is slow, this manure is especially adapted for vines: it therefore finds a natural market in the very places of its production. All the grains called oleaginous, after the extraction of the oil (a commercial product which itself does not remove the nitrogenous principles,) leave grounds which, twice pressed hot, are sold under the form of plates, and under the name of "cakes."

The oil-cakes are for the most part good for animals, and also constitute justly esteemed manures. In this respect our analysis would class them in the following order:—

1. Cake of *Arachis hypogea*, which would be equivalent to twice its weight of dung; 2. Linseed cake, one of the most esteemed foods for cattle; 3. Cakes of *Madia sativa*, as yet little known, but which appear to us well adapted for feeding;* 4. Cabbage-cake.

Among the manufactures which derive their first matters from products of cultivation, and yield residues useful as manures, are those of native sugar and starch. We have already pointed out the value of the leaves separated from beet roots and potatoes when they are dug up; it remains for us to speak of the pulps, scums, deposits and washing waters.

In the manufacture of beet root sugar, the pressed pulp constitutes an aliment estimated at equal to the beet roots themselves, for it contains, within a few hundredths, the same proportions of sugar, of albumen, &c. &c., and is presented in a suitable state of division, better freed, moreover, than the entire roots from earthy substances, altered portions, &c. However, when the production exceeds the consumption, and when there is no means of keeping it, a portion of the pulp is directly employed as manure; the table shows that in the normal state, as it comes out of the presses, it contains 0·7 of water, and represents 0·85 of its weight of dung.

The scums and deposits of the defecations abounding in albuminous substance, united with lime, yield to the soil a portion of the nitrogenous matter useful for manuring: we have not yet analysed it. The washing waters of black before revivification contain analogous matters, so much more favorable, as they are accompanied by fine animal charcoal, whose useful properties are indicated further on.

The pulp of potatoes, washed in order to extract the fecula from it, forms a good food, provided, however, that the excess of water be eliminated by pressure, and that a less aqueous kind of food be added to it; it sometimes happens, and especially at the end of the working season of the starch manufactories, that the pulp, besides of the worst quality, coming in competition with green fodder, can no longer be consumed as food, and is then used as manure; it is particularly adapted for composts, in which its spongy nature retains the humidity useful for disaggregating the ligneous parts. Analysis shows that its dry substance is equivalent to that of farm-yard dung, and that in the normal state, as it leaves the press,

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* In the two farms under the direction of each of us, we have been enabled to assure ourselves of this fact, which the external appearance of the residue in question had rendered doubtful.

100 parts of pulp represent 131 of humid dung.

The washing waters of the pulp of potatoes, decanted from the fecula, then stored in vast glazed reservoirs, from which they flow into watering trenches, may furnish to the soil a manure whose value it was convenient to estimate.

This was so much the more important as the waters in question occasion by their spontaneous alteration serious inconveniencies in many localities. The problem has been solved, and this time enlightened practice has sanctioned the analytical results. A striking example of this is now before the Academy of Sciences, where it was brought by M. Dailly, one of our cleverest agriculturists. We perceive from this communication that, devoting himself to laboratory operations, M. Dailly has been able to convert into a manure, realising an annual profit of 1,600 francs, the waters of his large starch manufactories, which, not long since, from their fetid exhalations, occasioned him considerable injury.

The table shows that the washing waters, weighing about four times as much as the rasped tubercles, contain 0·0085 of dry substance, which represents 0·0828 of its weight of nitrogen; so that the washing water is equal to 0·17 of humid dung: it may be usefully employed in irrigations on slightly inclined lands, with which the parts to be fertilised may be successively drenched.

Deposits from the Waters from Starch Manufactories.—The waters of which we have been speaking, during the extracting of the fecula, deposit in the reservoirs in which they are kept, insoluble organic matters; the latter, removed at the end of the fabrication, drained, then dried in the air, constitute a pulverulent manure, which analysis has shown to be equivalent to about half its weight of ordinary *poudrette* (human excrement reduced to powder); indeed, employed comparatively in this proportion by M. Dailly, it appeared to him practically demonstrated that 200 parts may really be used in place of 100 parts of *poudrette.*

Mixed Manures (*Animal Excrements*).—It is known that solid excrements, plus the portion collected of the urine of animals, constitute the richest substance of dung; the mixture of all these dejections, which we have taken for a common manure under the name of farm-yard dung, is, as is seen, sensibly equal to the mixed dung of cows, and is worth 0·33 less than mixed horse-dung. This is not the only remarkable difference which exists between these two dungs: the latter, whose components contain less water and more of matters rich in nitrogen, is more active, "warmer," as agriculturists say. When it is employed separately, it is especially adapted for lands which are generally damp and cold; in this respect it approaches near to the dung of goats, sheep and pigeons. The mixed dung of cows, on the contrary, containing more water and less nitrogen, is employed in preference on dry, sandy, or arid soils; other diluted manures, for the same reasons, are advantageously employed in similar circumstances.

Moreover, each of these manures, as well as their mixtures, will be usefully employed on all soils, if appropriate modifications be made in them.

They may be ranked, according to the numbers of the table, in the following order, established between these manures in the normal state:—Excrements: 1, of goats; 2, of sheep; 3, of horses; 4, of pigs; 5, of cows.

Animal Remains.—All the products of the cutting up of animals may be turned to account in the country. Some of them, such as skin, hair, tendons, horns, compact bones, thick or of large surface, feathers, &c., constitute the first matters of various well known branches of industry, and all of which leave to agriculture such of these matters as are of inferior quality, and which they reject, as well as the residues of the operations which they make them undergo.

The coarser feathers, such as cannot be used for making beds, &c., constitute excellent manure, easily apportioned, and spread in lines with the seed. They are bought at 60 francs the 100 kilogrammes, for the cultivation of hemp in Romagna.

The rasping of horn constitute a very rich manure, and in a state of division which enables it to be properly apportioned, and favors its always very slow decomposition.

Muscular flesh, a portion of the tendons and of the skin, are, in general, applicable to the feeding of animals, and to rendering the vegetable food more nutritive: pigs in particular benefit more by the addition of raw than of cooked flesh; but the latter gives to their own meat, especially to that of the fine race of Hampshire, a better quality, and it is important to reserve the distribution of raw meat until the time for fattening the pigs. The flesh which is not thus used may advantageously be dried, after being boiled with water or steam, then reduced to powder and employed as manure.

The blood of slaughtered animals is less fit for feeding pigs; given in as large quantities as flesh, it appears to cause serious diseases; it should, therefore, be mixed with larger quantities of vegetable food, or reserved for manuring the land.

In this last respect, its preparation is, moreover, very easy: it is sufficient to coagulate it by boiling, to dry it in the air or in an oven, and to preserve it in barrels. Blood dried without heat remains soluble, and presents the inconveniences of liquid blood.*

Considerable quantities of these manures are annually at the disposal of agriculturists: they arise from animals which die accidentally, or of disease, or which are killed in great number near populous towns; besides, especial establishments are formed for preparing and sending out these pulverulent and very rich manures. Their strength and equivalents, given in the tables, show that they are of sufficient value to support the expenses of transmission to great distances. They are the only ones, indeed, that can be exported to the colonies, where their price, raised to 40 francs per 100 kilogrammes, is not an obstacle to their employment.

Bones are generally applied to agricultural purposes, after the fatty matters contained in the adipose tissues of their cavities are extracted. They are then coarsely ground between the teeth of iron cylinders, and they form a manure of long duration, for the organic matter, defended by an abundant inorganic substance, only very slowly yields the products of its spontaneous decomposition, at least, provided that the division has not been carried so far as in bone raspings, the residue of bone turners' work, particularly alterable when the humidity of the soil and the temperature favor its decomposition.

On inspection of the tables, it will be seen that, all circumstances being favorable, the animal remains sold in commerce, considered as manures, may be classed in the following order:—1. Woollen rags and feathers, which represent from 38 to 44 times their weight of dung: 2. Dried blood and raspings of horn, whose value is more than 36 times that of normal dung: 3. Soluble blood, which, indeed, in this state would produce less than its richness indicates: 4. Hair of oxen, which represents 34 times: 5. Dried flesh, which is worth about 32 times its weight of dung; and which, on account of its more powerful cohesion than dried coagulated blood, produces directly rather more effect than its equivalent: 6. Salt fish, which, rendered unfit for human food by spontaneous alteration, would represent nearly 17 times the value of dung, and which, freed from salt, pressed and dried, would be worth more than double, according to the analytical indications of the tables: 7. Ground bones (*os fondus*) dried in the air: 8. Fat bones: 9. Moist ground bones: 10. Humid coagulated blood, which represents about 12 times its weight of dung.

Among the animal remains directly ape plicable to the manuring of land, we havl comprised cockchafers, which, in equa weight, would represent four times the value of ordinary dung; at this rate there would be in many localities a triple advantage in collecting these insects. Indeed, compared with the price of dung (about 60 cents the 100 kilogrammes), at least two francs might be paid for the same weight of cockchafers, and the enormous depredations occasioned by the white worms (*vers blancs*) would thus be considerably diminished.

One difficulty which this very desirable application presented in our experiments was owing to the tenacity of life of these insects: we were enabled to overcome it economically, by pouring, on one hectolitre of cockchafers, for example, in a cask, a half hectolitre of milk of lime containing five kilogrammes of lime,—an agent which may be considered as gratuitously obtained, since this quantity is far from equal to that which would be advantageously employed every year on most lands in cultivation.

Locusts, which often cause considerable devastation, especially in Normandy, may be stopped in their peregrinations by means of trenches, in which their innumerable swarms may be destroyed by pouring on them recently prepared milk of lime. The manure obtained would probably compensate for the expense of this useful operation.

RESIDUES OF VARIOUS OPERATIONS ON ANIMAL MATTERS.

Under this title we might have comprised many of the above-mentioned remains, but we thought it better there to treat of substances in the normal state, or only mechanically divided, and to reserve, in order to speak of them here, the more or less altered residues of certain operations relative to animal substances: in all these residues, the organic matter abounds in nitrogen; however, its action, generally very favorable as manure, seemed to present very great anomalies: we shall show that these anomalies are, in fact, only apparent.

Woollen Rags.—In large towns, these remains are collected from different tissues used: a portion is employed in certain manufactures, the preparation of velvet or flock paper (*papier velouté*), ammoniacal products, &c.; very large quantities are used for manuring vines and olive trees; its very slow decomposition causes it to act for six or eight years; according to our analysis, it ranks among the richest manures.*

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* Liquid blood might be employed as manure, but it decomposes so rapidly, that its products exhale without producing much effect, at least if it be not diluted with a very large quantity of water, and used in irrigations, the earth being able in this case to retain the widely disseminated liquid or gaseous products.

The application of woollen rags has been for a long time practised in southern countries, in the culture of olive and mulberry trees, the vine, &c. We will here give an example of the utility of this rich manure in our departments of the centre. M. Delonchamps, proprietor of a farm of 185 hectares at the Château de Fontenelle (Seine-et-Marne), has effected considerable saving by the employment of this manure. He procures the rags from Paris. A single vehicle with three horses brings 3,000 kilogrammes, which cost 180 francs, sufficient for manuring 1 hectare, and whose good effect is perceived from the third year. This quantity is substituted for 45,000 kilogrammes of dung, which, at 70 cents, would cost 315 frs.

M. Delonchamps, after having manured a portion of his land with woollen rags for three years, spreads dung on it for three other years, in order to keep the soil sufficiently light; then he returns to the rags.

Besides the direct economy thus obtained, transmission is facilitated, which is sometimes so expensive on heavy lands after rain.

It is convenient to divide the rags as much as possible before spreading them: this is done by means of scythe blades planted at 45° on a block. This economical manual operation leaves the rags cut in rather too large pieces; thus numerous higher tufts are seen in manured lands, which correspond to rags placed at more or less regular distances.

Greaves.—This residue, chiefly composed of the membranes of the adipose tissue, and of the fat with which they remain impregnated, likewise contains small quantities of blood, muscle, and bone. Greaves are chiefly employed for feeding dogs; agriculturists are beginning to make an advantageous use of them as manure. In order to determine their composition, a common sample was first prepared by filing different portions of a cake of greaves, uniting and mixing these powders, then taking a sufficient quantity for desiccation, analysis, and incineration. The analysis of this substance shows that it is a rich manure. It is employed in quantities proportionate to its equivalent, and previously divided with a hatchet and a hammer; sometimes it is steeped, when divided, in hot water before being spread on the land; its action lasts for three or four years.

Dregs of Glue.—The manufacturers, after having treated the pieces of skins and the tendons with hydrate of lime, and after having washed them and submitted them to long boiling, obtain as a product gelatine or glue, and as residue—which they wash and press with the aid of heat—all the parts, unattacked by the boiling water, of the tendinous and cutaneous substances, hair, some remains of horn, bone, and muscle, besides a calcareous soap and earthy matters.

This mixture, very moist and warm on leaving the presses, putrefies with great rapidity, if it be not speedily dried; in the dry state it may be preserved for a long time free from putrefaction. It was after an immediate desiccation that the common sample submitted to analysis, the strength of which is indicated in the tables, was prepared. The processes of disinfection, of which we shall speak in conclusion, are applied with success to this residue, and increase its realisable effect, and obviate the inconveniences of the decomposition by rendering it much slower.

Powdered Human Dung (*poudrette*).—Poudrette is the name given to the residues, slowly dried in the air, of the deposits formed at the bottom of the receptacles into which privies are emptied.

Although putrefaction, during several years, greatly reduces the organic matter by removing in the form of vapor its most putrescible portions, the pulverulent residue obtained still gives out putrid gases, a portion of which may be absorbed without complete decomposition into the organs of plants, communicating to them a disagreeable odor, especially to their leaves. This may explain the abandonment of poudrette in certain localities; in Lombardy for example, where it is desired to preserve the excellent quality of the pastures, and to avoid introducing into them an odor which would injure the taste of milk.

In many other cultures, poudrette acts efficaciously on account of the proportion of combined nitrogen which it contains, with the exception of the cause of decay above-mentioned; it results from this, that it will always be necessary to compare with one another the various commercial poudrettes, and this has become particularly useful, since pulverulent organic remains, containing very little nitrogen, are mixed with the former matter, before it is completely dried. We have given the analysis of samples of poudrette of two qualities.

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* We have operated on woollen cloth of the first quality, entirely formed of pure wool; the inferior qualities containing threads of hemp, flax, and cotton, earthy substances, &c., from $\frac{5}{100}$ to $\frac{12}{100}$, their richness must be diminished in that proportion.

(*To be continued.*)

ON THE ANALYSIS OF SOILS AND MANURES.

To the Editors of The Chemist.

Feb. 21, 1843.

GENTLEMEN,—

It is with the greatest satisfaction that I find you are about to do agriculture an important service, by appropriating a portion of your valuable columns to AGRICULTURAL CHEMISTRY.

The table you published, as taken from Noad's *Lectures*, is of service to the farmer, since it draws his attention to the inorganic constituents of plants,—a subject hitherto, I may say, totally neglected by agriculturists. Tables of this sort would be of infinite service, embracing all the usual products of a farm ; and as the German and French chemists have labored especially in this field, they are good sources to draw from. Such authorities as Sprengel, Meyer, Dumas, Schübler, Boussingault, De Saussure and De Candolle, are indisputably good, and cannot fail to instruct us.

Again, it would be of great advantage to the farmer, if he knew how to analyse his soils; and I do not know of any work where he may learn the best means of doing so. The process recommended by Sir H. Davy is faulty; and that suggested by the Rev. Mr. Rham, in the *Journal of the Royal Society*, if any thing, worse, because more complex. In deviating from the usual modes of analysis, with the endeavor to render things simple, I am inclined to believe analysis has been rendered infinitely more difficult.

In addition to the analysis of soils, the farmer might be instructed in that of manures, such as are now much in vogue, and procurable only at a heavy outlay. Such, for instance, as bone-dust, guano, nitrate of potassa, nitrate of soda, soot, &c. &c. These manures are often adulterated, and at the present moment the farmer is open to every fraud of the seller, from his thorough ignorance.

Trusting, Gentlemen, that you will excuse the above hints and come to our aid,

I am,
Your obedient Servant,
COLUMELLA.

PREPARATION OF BLACK OXIDE OF MERCURY; WITH OBSERVATIONS ON COLOR MAKING.

To the Editors of The Chemist.

GENTLEMEN,—

If you think the following preparation of black oxide of mercury worth inserting in THE CHEMIST, it is at your service.

It is original with me, so far as I know, and although somewhat operose and roundabout in its details, it furnishes a medicine of more activity than the London blue mass, and is more permanent than any other preparation of protoxide of mercury that I have seen.

Boil calomel in pure water, with a considerable excess of bicarbonate of potassa, (sold largely in this country under the name of *sol seratis*) with constant stirring, until it becomes of a dirty or dull greyish white ; decant the solution, and remove all traces of potassa, by repeated affusions of boiling water. Triturate it two or three times with ammoniated alcohol (of the shops), in quantities sufficient to cover the mass to some little depth, when at rest ; afterwards wash the powder, which has now become of a very dark slate color, in several parcels of the strongest commercial alcohol (free from alkali), drain on a filter, and spread to dry in a dark place, that the ammoniacal odor, if any, may exhale, and preserve in a close bottle secluded from light. This powder after being kept some time, becomes of a light slate or grey color, probably from loss of water. A sample of this preparation, which I have had by me for ten years, shows under a strong magnifier no yellow deutoxide or globules of metallic mercury. Please try it, and form your own judgment.

Can you not, gentlemen, publish in your valuable Journal, some *boná fide* processes for the preparation of colors or pigments ?

Scarcely one published recipe in a hundred will produce a marketable article. Witness, for instance, the directions in Ure's Dictionary for the preparation of Schweinfurth or emerald green ; nothing is there said about adding vinegar to the *mixture* of verdigris and arsenic, and yet I find it necessary, in order to develope the fine green tint. By this management, an amorphous powder of tolerably good color is formed, but I have entirely failed in producing the fine scaly or crystalline appearance, which is essential to bring out the color in its full brilliancy.

If compatible with the design and interests of THE CHEMIST, I should be gratified that you would take up this subject, and show how the best quality of this pigment may be manufactured, and whether the oxide of copper precipitated from the sulphate by alkalis, cannot be substituted for and made to yield the same blue-green tint as verdigris. Perhaps less is known of the principles and manipulations of color-making among scientific chemists, than any other department of chemistry. May we not hope that you will investigate the manufacture of colors, and disperse the clouds and darkness that envelope it. Very respectfully.

Yours, &c. E. F. Cooke.
Withersfield, Connecticut, U.S.A.
Jan. 16th, 1843.

[We will bear in mind the suggestions of our correspondent, for which he has our best thanks.

This communication being on two different subjects, which should come under the headings of Chemical Manufactures and Pharmacy, has perplexed us as to where to locate it.]

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ADDRESS TO THE PHARMACEUTICAL CHEMISTS OF THE UNITED KINGDOM.

We have long had it in contemplation to lay before our readers a retrospect or review of the Pharmaceutical Society, including—the ostensible objects of its establishment, and which ought to have been accomplished, but which have given way to individual advancement—what it *has* done —what it *has not* done—and what it *ought* to have done; showing, at the same time, the course pursued by The Chemist—the first and only real guardian of the interests of the chemists of this great country. We are the more forcibly impelled to this by the circumstance that a Charter (*recognising its existence!!!*) has been granted by Her Majesty to this self-constituted and ill-managed body, which consists of only about one eighth of the trade, and by the appearance of a pamphlet by Mr. Jacob Bell entitled: "*A Concise Historical Sketch of the Progress of Pharmacy in Great Britain, from the Time of its Partial Separation from the Practice of Medicine until the Establishment of the Pharmaceutical Society.*" We should have given this retrospect earlier, but that we were determined to give them full scope, and to wait until they had shown themselves in their true colors. That time has now arrived.

Before entering upon the subject of the Pharmaceutical Society, it is necessary to enter into a recapitulation of the state in which we found matters in the year 1839, prior to the commencement of this Journal.

At that period, there was a violent warfare carried on between the apothecaries and chemists. Each of these was jealous of the encroachments of the other; but the former had the advantage of being upheld by all the medical periodicals of the day, while the latter had no means of giving vent to their long smothered grievances. The apothecaries, through their principal speaking-trumpet, The Lancet, lavished on the chemists the unmerited epithets of—"quacks, impostors, mountebanks, jugglers, marauders, poisoners, ignorant druggists, murderers," &c. &c. &c. By means of the Medical Press, these opinions relative to the chemists of this country made their way, uncontradicted, unrestrained, and unopposed, all over the world; and, in consequence, we find the enlightened *Pharmaciens* of France and Germany regarding them as the most ignorant wretches on the face of the earth; as men of whom the Apothecary in "Romeo and Juliet" was but an average example; as degraded, mean, pitiful creatures, who, without knowledge, would undertake to treat any and every disease in order to grasp a few paltry pence for medicine from their unhappy victims.

Having decided on commencing a periodical embracing Chemistry and its Applications to the Arts, Pharmacy, &c., we determined to devote a portion of our space to protecting the interests of this numerous and intelligent body,—hitherto unrepresented,—and to rescuing them from the obloquy cast upon them by their enemies, the apothecaries. The result of this determination was the appearance of THE CHEMIST, on the 1st of January, 1840—an event hailed with delight by the trade throughout the kingdom.

In publishing THE CHEMIST, the following were the principal objects we had in view:—To advance chemists in knowledge by bringing within their reach the discoveries and improvements in chemistry and Pharmacy made within the period of publication: to prove to the world that chemists were not so sunk in ignorance as was imagined: to repel the attacks made by the apothecaries: to contend for their privileges: in a word, to raise them to the level of their Continental brethren, and to demand for them proper political rights.

When we joined in the strife, it was not to prop up the tottering interests of a retail shop; not to benefit ourselves in any way by taking up the cause of a class of which we were not members; we did not work upon the fears of the trade in order that we might profit by protecting them; and, when every chance of obtaining more money had failed, to betray the victims into the snare set for them by their enemies. No: we had no selfish interest to serve in befriending the then helpless chemists: we hoped for no reward beyond that inward and delightful feeling—a consciousness that we have been greatly instrumental in raising the position of those whose cause we espoused. We have our reward.

But to proceed.—Towards the end of 1840, we found chemists in some measure awakened from their apathy to a sense of their wrongs, and more willing to adopt measures for their own safety, and for the amelioration of their political and scientific condition. Thus we had already effected some good. The glorious work was begun.

In our October No. (1840), page 281, we published an article entitled: "Medical Reform.—Proposal to form a Druggists' Association similar to the British Medical Association:" in this article the following passages occur:—

"We trust that the druggists will lend us their assistance in obtaining redress of their grievances. They should call MEETINGS in London and OTHER LARGE TOWNS, and ORGANISE their PLANS: they might even form an association, similar to the British Medical Association, to carry out their views.* Such an Association would, we feel convinced, immediately be thronged with members, and would be too powerful to be successfully resisted. To it we would cheerfully lend very efficient assistance: our pen should always be in readiness to aid it in its endeavors to obtain that which is due, both to the druggists and to the public.

"We beseech chemists and druggists to act on the above suggestion, and we think there is no reason to doubt success. Our great object is to obtain a division of the branches of the medical profession, in which chemists and druggists will take up their proper position,—an object which will be obtained if the measures we propose be adopted—certainly not without.

"There is no time be lost: the meetings, if called, must be called AT ONCE:—we are sure they would be very numerously and respectably attended."

In the commencement of November, or it may have been at the end of October, 1840 (and not, as Mr. Bell erroneously states, in the pamphlet already alluded to, in February, 1841), Mr. Hawes' Bill was printed by order of the House of Commons, and an analysis of it was published in THE CHEMIST for December.

Well, from the period of the publication of this Bill, in October or November, 1840, to February, 1841, no steps were openly taken to prevent it from passing into a law. However, it was read a first time (if our memory do not deceive us, in the beginning of February), and was appointed for second reading on the 19th. With the provisions of this Bill, all of our readers are well acquainted; we need not, therefore, enter into them.

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* Thus, it is clear, that we first suggested the formation of a Society, and that we saw the necessity for doing so long before our suggestions were acted on. Little did we think that we were devising a plan for the advancement of one or two designing men!

Matters were now becoming serious: not a moment was to be lost. Mr. Farmar,—to whose laudable energy and zeal the Pharmaceutical Society owes its existence, and chemists and druggists the maintenance of the right of prescribing, according to their ancient practice,—in conjunction with some others of the trade, perceiving that the effect of Mr. Hawes' Bill would be the destruction of their vocation, called on many of the most influential wholesale and retail druggists, and persuaded them to sign a requisition convening a public meeting of the trade, to take place on the 15th of February.

Every one knows what followed. The trade met; resolutions condemning the stringent clauses of the Bill were passed; a Committee was appointed to give effect to those resolutions; a deputation of the Committee waited on Mr. Hawes, and the result was, that the clauses were struck out of the Bill.

But the chemists, very properly, did not rest here. Present danger having been avoided, future danger was to be prevented.

A Society—the PHARMACEUTICAL SOCIETY—was formed. From this Society much good was expected. We thought well of it, and used our influence, which by that time had become exceedingly powerful, in its behalf. We called on the Trade to join it; to support it with money and interest. THE CHEMIST was the only literary friend of the Society. (*See* Nos. XV. XVI. XVII. XVIII. XIX. and XX.)

Thanks were voted to us by most of the Country Meetings, for the powerful aid which we had so disinterestedly afforded to the Society. In London alone, no thanks were awarded to us; this would not have answered the purpose of the designing parties already alluded to (for to them chiefly do we attribute this intentional piece of disrespect and ingratitude), as they intended to commence a Journal in opposition to the one which had so mainly assisted in the formation of that Society, which they were about to pervert to the advancement of their own interest.*

Towards the conclusion of 1841, a strong feeling began to prevail among the chemists residing at a distance from the metropolis, that they could never derive any advantage from the Society, and they poured forth their complaints in THE CHEMIST. But of this subject we shall speak further on.

It soon, however, became evident, that an under-handed game was being carried on; that a Society intended for the general good of the Trade was being perverted, so as to serve the interests of several designing individuals. These persons endeavored to get all into their own hands, and they have succeeded so far. But we will drag their designs to light; we will brand them with having betrayed those whom they have deluded into paying their money for protection.

As soon as the PHARMACEUTICAL SOCIETY was actually formed, it became evident that the "pickings" would be considerable. So, we hear of pharmaceutical *tea parties* in Oxford Street, entertainments at which, we suspect, beverages more potent than tea regaled the guests. Now, we know that these *tea-parties* were not without their object,—people in such a situation don't give tea-parties for nothing: of course they were then securing the support of those around them; it is impossible to refuse support to a man when you are drinking his tea and eating his toast!

Mr. Bell soon after conceived a project, mighty in its conception, but puerile, nay, infantile, in the manner in which it has been carried into execution. Seeing, with envious eyes and inward groanings, the deservedly high popularity of THE CHEMIST, he determined on trying his hand at editing a Journal. Accordingly, he commenced a periodical, and (over a cup of *tea*, we suppose) obtained the sanction of the Committee. To this sanction, it seems to us, a condition must have been appended, namely, that the aforesaid Journal should use its best endeavours to get members for the Society (which means, of course, subscribers to the Pharmaceutical Journal) by persuading them, and frightening the refractory, with the statement, which we shall show to be erroneous, that if they did not join the Society, and pay their money, after a certain time, a Charter would be granted, and then they must belong to it, or be stopped in their practice.*

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* We need not say how fruitless that opposition has been,—of course the production of such a person as Mr. BELL, and under such circumstances, could not affect our greatly increasing circulation.

The Pharmaceutical Society has obtained a Charter, but it never will possess an atom of power to compel chemists to become members. The Charter does not confer on it any power beyond that of a trading company. A chemist and druggist who is a member of the Society possesses no -advantage over one who is not.

They would lead the unwary druggist to believe, that he will not be allowed to practise without their sanction; but they cannot prevent him, and dare not make the attempt.

We hope our readers will not be frightened or persuaded into joining this Society; they have no cause for fear, if they will but refuse it their support. The monopoly will fall to the ground, and will become totally inert, in a very short space of time. It cannot stand: such a thing is utterly impossible, and we shall soon see an end to the gross imposition. We have heard, from very excellent authority, *that the greatest dissatisfaction prevails among the members*, and that if the Charter had not been granted, or if there had been any further delay in granting it, the Pharmaceutical Society would not have numbered one hundred members after the next subscription day!!!

Provincial chemists and druggists, especially, can never derive the slightest benefit from this monstrous piece of humbug; all the advantages,—and they are very few and insignificant,—are confined to those who live in the metropolis.

This Society would have been a most useful one, if its management had been entrusted to persons of sufficient ability and integrity, and of liberal mind. As it is, its original objects have been lost sight of, and nothing but the promotion of individual interest, and the gratification of sinister desires, has been thought of or cared for. Money has been wrung from the fears of chemists, and is applied to any purposes but those for which it was originally intended—the protection of the trade. But chemists are now beginning to find that we have been right all this time; they perceive that the members of the Pharmaceutical Society are dropping off very quickly, and that there is every prospect of its speedy extinction.

We cannot but wonder how so many men of business, intelligent men, should have been deluded into paying the annual tax of two guineas, from which they never can derive one atom of benefit. What will become of these subscriptions if the College of Physicians become invested with the power of examining, and of granting diplomas to, persons about to practice as chemists? Why, the Pharmacuetical Society will have your money, but the College of Physicians will have the power, and you will have to pay the latter over again for the diploma! It is decided that the Government measure of Medical Reform will confer this power on the College of Physicians.

It now remains for us to demand of this Society, or the self-appointed Editor of their *Transactions*, on behalf of seven eighths of the druggists of this country, and who are not members of it, answers to the following questions:—

1. What are your intentions with regard to the future? *i. e.* What are you going to do for the two guineas per annum?

2. What equivalent can you offer to the provincial druggist for the two guineas annually demanded from him?

3. Why is your subscription fixed so high as two guineas per annum, when the admission-fee to the Apothecaries' Company, is but six guineas for life, and that of the College of Surgeons, only twenty-two guineas

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* Assistants about to enter into business need not join this Society, nor submit to its examination.

for a diploma, including free admission for life to the splendid Museum and a magnificent Library, and to numerous Lectures, by the most eminent Professors? You demand the annual interest of £40 or £50.

4. If a chemist about to enter into business were to reflect upon the relative advantages of insuring his life or becoming a member of your Society, and if he should use the following argument:—"If I insure my life for £100 (which a young man can for about £2 per annum), and live for fifty years, I shall leave behind me the amount so expended: but if I became a member of the PHARMACEUTICAL SOCIETY, I shall, in the same time, be exactly £100 poorer;" what answer would you or could you give him?

5. What is to prevent you giving your diploma, on examination, for £5, without any annual payment?

6. What will you do when the College of Physicians is endowed with the power of examining and licensing chemists and druggists? In this case, we apprehend, nothing can be done: the present Government are not likely to be turned from their purpose.

7. Why are you to take both the teaching and examination into your own hands?

8. Is it to be expected that you will be fair and impartial in your examinations?

9. Will you not look with the most jealous eyes on all candidates for a diploma, knowing that every new member is an additional rival in business?

10. Do you not know that the proposed Government measure of Medical Reform will entirely, and under heavy penalties, prohibit counter-practice?

11. Does the PHARMACEUTICAL SOCIETY represent the chemists and druggists of this country?

12. Does it represent one-eighth of them?

13. *Does the Council really represent the Society?*

14. How is it that Mr. Payne, an apothecary, accoucheur, cupper, bleeder, leecher, tooth-drawer, *cum multis aliis*, is allowed to remain not only one of your members, but actually your Vice-President?

15. How dared you refuse the subscription of Mr. Hildreth Kay, a pure chemist and druggist, and one who would have done honor to your Society? (*See* THE CHEMIST, Vol. III. page 180.)

16. As regards your Journal, if you are to have one, why not have a good one, edited by a competent and perfectly educated scientific person, instead of that pitiful production which disgraces you in the eyes of your Continental brethren? Compare your trashy and boyish affair with the *Journal de Pharmacie et de Chimie*, edited by some of the most eminent scientific men in France, as Boudet, Virey, Bouillon-Lagrange, Soubeiran, Henry, Cap, Boutron-Charlard and Frémy; or with the *Journal de Chimie Médicale*, conducted by Beral, Chevallier, Dumas, Fée, Guibourt, Lassaigne, Orfila, Payen, Péligot, Pelletan, Pelouze, Richard, Robinet, with thirty eminent *collaborateurs*. Each of these Journals is, in this respect alone, like yours, sanctioned by a Society. Does not the comparison cover you with shame?

We demand answers to these questions; but we defy you to answer them otherwise than to the utter annihilation of your Society, and we trust that no man will afford you further support until they are satisfactorily replied to.

In our next Number we shall give a review of the Charter, and its effects on the trade, and shall take up the subject altogether more fully. In the mean time, we beg our readers to ponder awhile; let them not join this Society until we have completed our observations: MUCH yet remains to be said, and we are confident of being able to show that it is impossible for it ever to obtain any legal privileges, or ever to confer any benefit on its members or the public. Besides, no one will, we rest assured, be silly enough to enrol himself a member, until the questions which we ask have been replied to, and until we have had an opportunity of analysing the defence which may be set up.

Our case is now opened, and we are confident of being able to demonstrate all that we have undertaken to prove; but we have to wade through a great mass of documentary and other evidence, and must, therefore, defer the further consideration of the subject until next month.

TOXICOLOGICAL STUDIES CONCERNING THE VEGETABLE ALKALIS.

BY A. LAROCQUE AND AD. THIBIERGE.

(*Continued from p.* 138.)

I. EXPERIMENTS WITH BEER.

0·5 gr. of Smyrna opium* were divided in 125 gr. of beer; the mixture was treated by the process followed by Dr. Christison. The liquor containing acetate of morphia, furnished, by the reagents, all the characters of morphia; but all our efforts to obtain crystallised morphia were fruitless in this experiment, as well as in those which we are about to mention.

The precipitate containing the meconate of lead was divided, then submitted, as directed by Dr. Christison, to a stream of sulphuretted hydrogen. The liquor, filtered and evaporated, did not give the reactions of meconic acid; we redissolved it in alcohol, and the evaporated liquid likewise furnished negative characters.

At the advice of M. Caventou, we decomposed the lead precipitate by dilute sulphuric acid; but, in this case, the experiment, several times repeated, never detected the presence of meconic acid; however, it was not the same in the experiments about to be quoted.

We are at the present time occupied in investigating the cause of this difference of action between sulphuric and hydrosulphuric acids.

We afterwards made several experiments on mixtures of 125 gr. of beer with 0·5 or 0·25 of extract of opium.† These mixtures were treated by Dr. Christison's process, modified as we have said, and it was always easy for us to reproduce the reactions of morphia; we also always obtained the colorations of meconic acid in the liquors arising from the mixture of 0·5 of extract and 125 gr. of beer; but, whatever precautions we took, we were never able to characterise meconic acid in the liquors arising from the mixture of 0·25 of extract, and 125 gr. of beer.

II. EXPERIMENTS WITH MILK.

In our experiments on mixtures of 125 gr. of milk with 0·5 of opium, or 0·25 of extract, we were more fortunate. In all cases we were able to prove the presence of morphia and of meconic acid.

Dr. Christison, in his experiments on milk and opium, was able to characterise morphia only by its bitterness.

III. EXPERIMENTS ON BROTH.

We thought that it was as well, in order to complete these experiments, to seek for opium in mixtures of 125 gr. of broth with 0·5 of opium, and 0·5 or 0·25 of extract.

These different mixtures were submitted to the same mode of treatment, and it was easy for us in all cases to detect both morphia and meconic acid. However, it is well to remark, that in this case, when subacetate of lead is added, an abundant precipitate is formed, which, besides the meconate, contains sulphate and chloride of lead; it may be freed from the latter by adding sufficient water to dissolve it; by this means it is necessary to employ only a small quantity of sulphuric acid.

Our results differ much from those of Dr. Christison. We think we may assign as the principle causes of these differences:—

1st. The inequality of composition of the opium of commerce. It is known, indeed, that many chemists, amongst whom we may mention M. Robiquet, have analysed opium not containing meconic acid.

2nd. The process of analysis employed by Dr. Christison. This chemist, as we have said, decomposed the meconate of lead by sulphuretted hydrogen; we have shown that often in this case the meconic acid is found disguised, and that its presence could be detected only by decomposing the salt of lead by weak sulphuric acid.

3rd. The nature of the liquids mixed with the opium. The composition of these liquids is, indeed, very variable.

CONCLUSIONS.

We think we may draw from our experiments the following conclusions: 1st, by the aid of reagents, we may detect the presence of morphia, strychnia, and brucia, in matters which, after having been mixed with the salts of these alkaliods, have undergone alcoholic, acetous, or putrid fermentation. M. Orfila has already proved that putrid fermentation does not alter morphia.

2nd. Iodic acid, crystallised or in concentrated solution, possesses the property of being decomposed by neutral nitrogenous matters; but iodic acid in dilute solution can be decomposed by these matters only when concentrated sulphuric acid is added to it.

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* We tested the opium which we employed, and ascertained that it was rich in morphia and meconic acid.

† This extract was prepared by us according to the process of the codex, employing the opium whose analysis we have related.

3rd. Iodic acid should be employed only with great circumspection as a reagent for morphia.

4th. Perchloride of gold causes, with the vegetable alkalis, reactions, which may be used for distinguishing morphia, brucia, and strychnia.

5th. The reagents which merit most confidence, when it is required to detect the presence of morphia, are—nitric acid, the neutral perchloride of iron, and the perchloride of gold.

6th. By aid of reagents, we can prove the presence of morphia mixed with beer, broth, or milk.

7th. It is also easy to demonstrate, by reagents, the presence of meconic acid, mixed with broth or milk, especially when the meconate of lead is decomposed by weak sulphuric acid.

MALT LIQUORS *versus* MORALS.

"Nothing extenuate, nor set down aught in *malice*."

To the Editors of The Chemist.

GENTLEMEN,—

Perhaps you will hesitate as to the admission of this letter into your Journal, judging it to be extraneous matter; but allow me to suggest, that having given publicity to the *pro*, justice requires equal advantages for the *con*.—(*See* THE CHEMIST, Feb. 1843.)

The doctrine for which your correspondent "MEDICUS" is an advocate, has, indeed, *many* opposers; and I am induced to enrol myself among them, from the conviction that the principles upon which their opposition is grounded are so based in truth, and so philanthropic in their tendency, as to withstand the shafts of the sophist, and ultimately to secure the sanction of every patriot. I am well aware that many have, in the warmth of their enthusiasm and fire of their zeal, advanced statements so erroneous and fallacies so evident, as to secure them at once the condemnation of the partisans of "MEDICUS." But, Gentlemen, there is so much native cnbrilliay in truth, that it *will* scintillate, though blended with error, though shrouded with misrepresentation.

It is a just inference from the creed of "MEDICUS," that man in his natural state does *not* require artificial stimulants; if so (and human physiology will substantiate the assertion), the application of these stimulants tends to his injury, because Nature has provided him with no organ for their assimilation. But "we are living in an artificial state." True; but does this therefore justify us in the constant consumption of a drink against which Nature has set her voice; whose abuse (the afterbirth of its *use*) has lowered the standard of England's morals more than any other agent, and has been a strong helping hand in purchasing these "hard times" which now afflict us? By no means. Where, then, is the impolicy of discarding, *in toto*, that article which in moderation is attended with doubtful benefit, in excess with decided evil.

Gentlemen, in the laboratory of the chemist, alcohol is the source of much interest: in his manipulations, it frequently lends its friendly aid; in the hands of the physician, it is of value to heal some of the ills that flesh is heir to; but in the hands of society, where it flows free and fetterless among the ranks of men, it forms deep and woful impressions of its lamentable influence. It is custom that has betrayed us into the belief that "malt liquors" are well nigh essential to our existence; many and weighty facts have proved the contrary; and could no physical objections be urged against their use, the grand moral benefit which would accrue from their extinction, should be a sufficient motive to induce every man to avow himself a dauntless and unflinching advocate for the principles of the Irish patriot. [FATHER MATHEW.]

The high and repeated eulogiums passed upon your Journal require no comment; and I think that it will not be deemed derogatory to the high standard it occupies in the eyes of the scientific world, should its pages be found to contain an occasional letter of an ethical cast. I am, Gentlemen,

Respectfully yours,
VIRTUTAS.

[We cannot but observe that the *morale* of the matter is less adapted to our pages than the question as to the wholesomeness or the contrary of malt liquors, taken in moderation; however, we shall not interfere in the discussion, beyond keeping it within proper bounds. At present, we offer no opinion, as perhaps our correspondents "MEDICUS" and "VIRTUTAS" will have much argument to advance in support of their several opinions.

ON SOME OBSCURE CASES OF POISONING.*

BY DR. CHRISTISON.

THE first case, to which this section of the paper was confined, was one of death supposed to have been caused by spirits accidentally poisoned. Nine masons who had been working hard in a quarry, during a hot day, from an early hour in the morning until one o'clock, drank at that hour, in the course of a short period, seven half-mutchkins, or about 56 ounces, of a sort of "gin," manufactured by a travelling spirit dealer, who sold it to them on the spot. None of them seemed to have had less than two glasses, or more than four,—that is, from four to eight fluid ounces. They had no food after an early breakfast, except a little bread and cheese, which one of the party divided among a few of them, just before they took the spirits. No particular taste was observed in the spirits at the time, though one of the party at first demurred to drinking it, because it became milky with water. Two of the men, who had at least their full share, experienced no particular effect. Three others seem to have also experienced, little effect, but some headache in the evening. Two others, observing the serious effects produced in the subsequent cases, made themselves vomit, and also experienced, subsequently, nothing but inconsiderable headache. The seventh felt the liquor "go to his head" immediately, and continued to feel "stupid" for the whole evening. The eighth, who had taken four glasses, became in ten minutes suddenly stupid, and speedily quite senseless; in which state he remained for some hours, till he was roused by emetics and stimulants; and subsequently he had pain in the stomach for the rest of the evening, and all next day sickness and drowsiness. The ninth, who had taken, certainly not more than three glasses, possibly only two, fell down suddenly insensible, five minutes after having taken his last glass; and in five minutes more he expired. This was a man of 63, in good health at the time, not intemperate, yet accustomed to take his glass occasionally, like other workmen of his acquaintance. He was one of those who had a little bread and cheese before the drinking match commenced. The body was very carefully examined under authority of the sheriff of the county where the accident happened, but no morbid appearance whatsoever was found.

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* Read before the *Medico-Chirurgical Society* of Edinburgh; as given in the *Lond. and Edin. Monthly Journ. of Med. Science*, March, 1843.

The spirit-dealer's stock was seized for examination. The "gin" he sold to the men had a juniper odor and taste, without any bitterness or ratafia flavor; and a careful chemical analysis did not indicate the presence of any hydrocyanic acid, or of any vegetable poison which could cause such an accident as that described above. He stated that his gin was made with whisky, oil of juniper, and tincture of sweet bay. Whisky found in his house was ascertained to be free of poison. A bottle, alleged to be oil of juniper, was really that substance mixed with a little spirit. Another bottle, represented to contain a tincture of sweet bay leaves, had the taste and odor of the leaves of *laurus nobilis*, and was free from hydrocyanic acid. The plant, from which he said he gathered the leaves, grew in his own garden, and was ascertained to be really the sweet bay, or *laurus nobilis*. There was, therefore, not a single circumstance to warrant the presumption, which actually arose at first,—that the man had used by mistake the leaves of the common bay, or *cerasus laurocerasus*, the cherry laurel.

A careful inspection of the whole particulars, made by the law authorities after consultation with the author, did not throw any further light on this extraordinary case. The author, admitting its nature to be very obscure, was inclined, on the whole, to the opinion that the sole agent was alcohol; and that its diversified effects on the men depended on obscure constitutional circumstances.

In an Appendix to his paper, Dr. Christison stated, that he had recently succeeded in detecting arsenic in the liver of a person who had died of poisoning with that substance, and whose body had been buried for three months. The process followed was that of Orfila and Marsh, with some immaterial modifications.

He further announced that he had detected alcohol in the stomach in two instances, where spirits had been taken not long before death, and where a considerable period had elapsed between death and the date of examination. In one instance the body had been buried about three weeks, in the other no less than three months; and the contents of the stomach had in each case been kept six weeks longer. The process of analysis consisted in cautious distillation from carbonate of potash,—neutralisation of the distilled fluid with sulphuric acid to remove ammonia,—redistillation till a fifth of the fluid passed over,—and agitation of the new distilled liquor with dry carbonate of potash. A clear colorless liquor rose to the surface, presenting all the characters of rectified spirit, and amounting, in the case of three months' interment, to one fluid drachm, of the density ·836. The author concluded with observing that the possibility of detecting alcohol in such circumstances was, so far as he was aware, a new fact in toxicology.

Dr. Christison lastly observed that, on the two occasions just alluded to, he had applied for the detection of arsenic, the process lately proposed by Reinsch, in a recent German periodical, and which had just appeared in English in Dr. Cormack's *Journal*, and had obtained most satisfactory results; in medico-legal investigations, he considered it superior to every other process of equal delicacy,—greatly superior to every other in point of convenience, where complex fluids or mixtures of organic solids were to be examined,—and a process which, on the whole, was likely to supersede all others hitherto proposed.

DELETERIOUS EFFECTS PRODUCED BY AN INFUSION OF TOBACCO APPLIED TO THE SKINS OF CATTLE.

To the Editors of The Chemist.

Gentlemen,—

Thinking that the subjoined particulars respecting the deleterious effects produced by an infusion of tobacco upon the skins of cattle, might not be uninteresting, I beg to forward them for insertion in your Journal.

I acquired a knowledge of the facts, so far as he was able to give them, from a medical gentleman of this town, who, passing at the time, was summoned by the cow-boy to his assistance. The circumstance occurred about three weeks ago; and though I do not consider it necessary to mention the names of any of the parties concerned, I am ready to vouch for the authenticity of the statement. The effects of tobacco upon the system, whether used externally, or in the form of enema, have been long known.

It would seem that in consequence of the cows (four in number) having been for some time infested with lice, it was deemed advisable, by way of ridding them of this nuisance, to wash their hides with an infusion of tobacco. As to the strength of the latter I cannot speak. It was, however, prepared by the man who took care of the cows. In other respects, the cows, adds my informant, were in good health, and yielded daily a good supply of milk. The infusion, having a quantity of soap dissolved in it, was applied principally along the backs and sides of the animals. Three of these were lying dead in their stalls when my medical friend first saw them, not more than one hour and a half having elapsed since the application of the tobacco. The symptoms prior to death could not be ascertained. The man asserted that the whole mischief had been done by the washing, and that it was impossible, from the mode in which they were fastened, for them to have licked themselves. In all the three instances, there was, after death, considerable protrusion of the rectum.

The fourth cow, which was living, but apparently *in articulo mortis*, exhibited symptoms, which probably enable us to form some idea of the manner in which the others had been affected. It seemed to be dying, but in the hurry of procuring and administering certain remedies which it was deemed judicious to have recourse to, hardly a sufficiently minute examination could be given. Its fore and hind legs were spread out so as to form a wider basis, and prevent its falling, and a man was supporting it on the side to which it inclined. Its head, with the tongue protruding, hung down between its legs. No pulse could be felt; its eyes appeared dim, and in every other respect it showed signs of the most marked prostration and syncope. At the suggestion of the medical gentleman, stimulants in the shape of hot gin and water were immediately given, one gill of gin in a quart of water being administered by means of a horn. The beneficial effects of this medicine were soon perceptible. The pulse returned, the animal expelled a large quantity of urine, and in the course of a short time recovered. In the absence of all other stimuli, save brandy, rum, and whisky, gin was used. Such are the few, unconnected particulars which I have been able to obtain. With respect to the *modus operandi* of this narcotico-acrid poison, I am not called upon to offer an opinion.

I remain,
Very sincerely yours,
John S. Hiley, A.B.M.B.

Huddersfield,
March 10th, 1843.

ON THE PREPARATION OF OIL OF ROSES.*

A letter addressed from Arabia to M. Landerer, at Athens, gives the following details concerning this preparation:—The roses are taken to distilleries, in which from three to six copper alembics, without the slightest refrigerating apparatus, are met with. The picked roses are thrown into a cucurbit, water is poured on, and a sufficient quantity of salt is added; after two or three days' maceration, the distillation is commenced, and continued until the distilled liquor acquires a yellow color. The rose-water extracted from time to time, is poured, in order that it may cool, into clay vessels placed in water: it receives different names, and varies in value, according as it is collected quite at the commencement or at the end of the distillation.

It is the rose-water obtained at the commencement which is used for the preparation of oil of roses, and the following is the manner in which the latter is separated from it:—After having filled with this water large porous clay vessels, and having covered them with linen, they are sunk in the earth in rows, and they remain in it from nine to ten days, according to the coolness of the nights. They are covered externally with straw, kept wet, in order to keep them as cool as possible. The water is gradually covered with an oily layer which solidifies; this crystalline mass is removed with a skimmer, and the water is submitted to several similar refrigerations, until no more traces of oil exhibit themselves. The water, completely freed from oil, is sent to the markets to be sold, or even still serves for the preparation of an inferior kind of oil of roses, which is sent to Europe as Oriental oil of roses. This latter oil is met with in the bazaars of Constantinople, Smyrna, &c., and is obtained by agitating the rose-water, whose odor is still strong, with an oil which comes from Africa, and which results from the distillation of the wood of very high and odoriferous trees.

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* *Journal de Pharmacie*, February, 1843; from *Repertorium für die Pharmacie.*

ON THE PREPARATION OF LEAD PLASTERS.*

BY OTTO KOHNKE.

The old Dispensatories frequently prescribe the addition of vinegar for the preparation of lead plasters. Although this addition, considered perhaps as useless, appears lately to have fallen into disuse, the author, relying on the beneficial results which he has obtained, thought that he ought to call the attention of the profession to it. The following is the manner in which he prepares simple litharge plasters:—He puts in a tinned pan, nine pounds of olive oil and five pounds of litharge; then he adds about twenty ounces of colorless vinegar (two ounces of which saturate one drachm of carbonate of potassa); he then boils it until all the moisture has disappeared, and until only a few striæ of litharge rise to the surface; the pan is afterwards removed from the fire, and from 6 to 8 ounces of vinegar are again gradually added to it, stirring all the time. By boiling a second time, until all the moisture is evaporated, we obtain, says the author, in 30 or 40 minutes, a perfectly consistent plaster, extremely white, and perfectly similar in color to white lead plaster.

He arrived at the same result by boiling for some time the litharge with the whole of the vinegar, and then adding the mixture to heated olive oil, and boiling it.

[This observation is interesting; not that I wish to recommend the operation itself; (I prefer the ordinary process for certainty of result and for the beauty of the product:) it abridges, as he says, the time employed in saponification, but the curious part of the matter is the adoption of a process completely analogous to that which is now used for the preparation of white lead: a tribasic acetate of lead is formed, which has less cohesion than litharge, so that, notwithstanding the state of combination in which the oxide of lead is engaged, the fatty bodies act on it with greater facility; the vinegar is, therefore, an intermedium which, throughout the operation, is successively charged with oxide of lead, and gives it up to the fatty matter.—E. Soubeiran.]

ON THE PROCESSES OF PREPARING SYRUPS OF ACID JUICES.*

BY F. G. LEROY.

The syrups of acid juices are pharmaceutical products, whose processes of preparation are little susceptible of modification; it is not the same with regard to the proportions of juice and sugar which enter into their composition.

These proportions have long remained the same; every pharmaceutical work, every Pharmacopœia which has been published, details them, or, at least, gives them in the same proportion, without their authors having ascertained whether they might not be modified, in order to obtain better products, either with regard to their taste and odor, or to prevent them from undergoing any change in their condition.

Two processes are in use for the preparation of syrups of acid juices; they consist: the first in taking equal parts by weight of fruits and coarsely powdered sugar, which are put into a pan and boiled, stirring the mixture with a skimmer, until the syrup, put while boiling into a prover (*éprouvette*), marks 30° of Beaumé's areometer: it is then strained. This process is especially used for the preparation of the syrups of raspberry (*Rubus ideœus*), and of mulberries (*Morus nigra*); it preserves very well the agreeable taste and good odor of the fruit.

We may remark, however, that the Belgian and French Pharmacopœias order them to be prepared with fermented juices.

The second consists in taking the fermented juice of acid fruits, either recently obtained and filtered, or preserved by Appert's process, in the following proportions: according to most pharmaceutical works, and the French Pharmacopœia, 940 parts of sugar, and 500 parts of acid juice, melting the sugar at a gentle heat, in a glass matrass or in a silver basin, and straining; according to the Belgian Pharmacopœia, two pounds and a half of sugar, and sixteen ounces of acid juice.

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* *Archiv der Pharmacie.*

* *Journal de Chimie Médicale*, Mar. 1843.

It is evident that these quantities are nearly in the same relation, and differ little from the preparation of simple syrup, which are 1000 parts of sugar and 500 parts of water, in which the solution, made without heat, gives a product marking 35° of Beaumé's areometer—a density considered sufficient for the conservation of most syrups.

There is, therefore, only about $\frac{1}{17}$th less of sugar, according to the proportions of the French authors, and $\frac{1}{16}$th more of juice, according to the Belgian Pharmacopœia, than for the preparation of the simple syrup.

When the syrups of acid juices,—whether those prepared with equal parts of sugar and fruit, as the syrups of raspberry and mulberry, or those with fermented juices,—are prepared for the provision of the whole, or great part of the year, and when the indicated proportions are strictly adhered to, they frequently take the form of a crystalline mass, or pass entirely to the solid state, after having been prepared some months. When they are in this state, it is well known how difficult it is to sell them.

The cause of this change of state is due, in our opinion, as regards the liquid syrups produced with equal parts of syrup and fruit, to the presence of pectine, which, retaining much water, does not allow the crystallisable grape sugar which is formed under the influence of the organic acid contained in the acid fruits, on the cane sugar, to find sufficient vehicle to hold it in solution; and as regards the syrups produced with fermented juices, to the too small quantity of acid juice prescribed for their preparation.

Indeed, it is easy to be convinced, according to the proportions indicated in the Belgian and French Pharmacopœias, that for the preparation of these syrups, little or no account is taken of the density of acid juices, which varies between 3½° and 7° of Beaumé, nor of the modification which cane sugar immediately undergoes by seizing a portion of the vehicle in the state of water, under the influence of the organic acids which the juices contain; since at the moment of their preparation they mark from 38° to 39° of Beaumé's areometer. It is very certain that, at this density, if cane sugar were not modified under the influence of organic acids, and if it did not at first lose the property of crystallising, in the course of a day, a portion of it would be deposited under the form of crystals; nor has it been taken into consideration, that after their preparation, the acid syrups still increase in density, as I have ascertained by many observations; because the organic acids continue to act, converting a portion of cane sugar into crystallisable grape sugar, which is much less soluble than the former: from this it results, that on account of the great density of the syrup, this sugar, in proportion as it is formed, not finding sufficient vehicle to retain it in solution, is deposited in the solid state. It is almost always when these syrups have been prepared for three or four months, that their tendency to pass to this state is perceived. This alteration is first remarked by a granular deposit at the bottoms of the flasks, and which goes on increasing until the whole mass is solidified. When this solidification has once commenced, it is sometimes completed in less than a month.

That which we have just been speaking of, with relation to the production of crystallisable grape sugar in acid syrups, a long time after their preparation, sufficiently proves that the reaction of the organic acids contained in the acid juices, on cane sugar, is continued after the preparation of these syrups, although cane sugar is totally modified under the influence of acid juices; only a small portion of it passes to the state of crystallisable grape sugar; we are assured of this, by reflecting on the difference of the solubility of these two sugars. We know, indeed, that 200 parts of cane sugar are entirely soluble in 100 parts of water at the ordinary temperature, and give a syrup marking 35° of Beaumé's areometer; while the same quantity of water can dissolve only rather more than 63 parts of crystallisable grape sugar. It is evident that it would be sufficient that one fourth of the cane sugar should pass to the state of crystallisable grape sugar, in order to solidify the whole mass. We should also take into the account, the circumstance that one part of the vehicle in the state of water enters into combination with one part of cane sugar, whose composition may be represented, according to M. Péligot, by $C^{48} H^{44} O^{22}$, crystallised cane sugar, to become $C^{48} H^{56} O^{28}$, crystallised grape sugar, which still diminishes the quantity of the solvent.

Crystallisable grape sugar should also be produced in much less quantity, on account of various combined circumstances, as the action of heat, the greater or less acidity of the juice, for it has very often been sufficient with most syrups of acid juices, which had entirely passed to the solid state, to bring their density to 33° or 34° Beaumé, adding $\frac{1}{12}$th of juice, to prevent them from again assuming this state.

Having been led by our observations to attribute the deposit of crystallisable grape sugar to the too great density which authors have hitherto prescribed for syrups of acid juices, we have tried, by modifying the proportions of sugar and juice, whether we could not prevent this deposition, at the same time giving to these preparations sufficient density for their conservation, by preventing fermentation from being set up.

The proportions which succeeded best with us, are the following :—To three parts of very white and dry loaf sugar, add two parts of acid juice ; or, if required, to one kilo. and a half of sugar, add one quart of recently obtained and filtered acid juice ; melt the sugar in it at a gentle heat at first, raise the temperature sufficient for the complete solution of the sugar, then strain.

The very gentle boiling which we recommend, is not alone with a view to the complete solution of the sugar, but to facilitate the reaction of organic acids on cane sugar, a reaction which is partially operated by time, in acid syrups prepared at a gentle heat, and which contributes to increasing their density.

The proportions which we take, and which we have used several years, have generally given preparations marking 35° or 36°, and sometimes more, which keep very well, and which do not present the inconvenience of passing to the solid state. We think that it is sufficient to detail a few preparations, to prove the truth of that which we advance.

I. SYRUPUS RIBIS.

Three parts of sugar, or a kilo. and a half, and one litre of acid juice, of the density of 3½° Beaumé, its temperature being at 10° C., produced a syrup which marked 36° Beaumé at the temperature of 9° C.

II. SYRUPUS RUBI IDEŒI.

Three parts of sugar, or a kilo. and a half, and one litre of acid juice, of the density of 3½°, at 10° C., produced a syrup marking 35° Beaumé at 15° C.

III. SYRUPUS PYRI CYDONIÆ.

Three parts of sugar, or a kilo. and a half, and one litre of juice of the density of 7° Beaumé, its temperature being about 13° C., furnished a syrup which marked 31° Beaumé at 88° C., and 36° Beaumé at 11° C.

IV. SYRUPUS RHAMNI.

Three parts of sugar, or a kilo. and a half, and one litre of juice, of the density of 4½° Beaumé, at the temperature of 5° C., gave a syrup which marked 31½° B. at the temperature of 82° C., and 35½° B. at the temperature of 15° C. This syrup, according to the Belgian Pharmacopœia, is prepared like the syrups of acid juices, that is to say, in the same proportions.

The syrups of acid juices prepared with recently obtained fermented acid juices, in the proportions which we have indicated, are, in general, agreeable products, possessing a good odor, and taste of fruit, which those prepared in the ordinary way have not, and whose taste is disguised by too large a quantity of sugar ; they do not present, like the latter, the inconvenience of becoming solid.

We know that the latter inconvenience may be obviated by preparing the syrups, when wanted, with juices preserved by Appert's process. This is an advantage ; but it is true that these syrups never present the good taste, and agreeable odor of syrups prepared either with fruits, or fermented juices newly obtained and filtered ; for it cannot but be admitted, that although the juices are well prepared by Appert's process, they undergo such modifications that they do not present the same qualities as when they are recently obtained.

We think, therefore, that the following syrups of acid juices should be prepared with fresh filtered juices, in the proportions of three parts of sugar, or a kilo. and a half, and two parts of acid juice, or one litre.

These syrups are those of—

Barberries (*Berberis vulgaris* L.)
Cherries (*Cerasus communis* L.)
Quinces (*Pyrus cydonia* L.)
Raspberries (*Rubus ideœus* L.)
Pomegranate (*Punica granatum* L.)
Currants (*Ribes rubrum* L.)
Lemons (*Citrus limonum* L.)
Mulberries (*Morus nigra* L.)
Myrtle (*Vaccinium myrtillus* L.)
Buckthorn (*Rhamnus catharticus* L.)
Oranges (*Citrus aurantium* L.)
Apples (*Malus communis* L.)
Vinegar (*Acetum vini*).
Raspberry Vinegar (*Acetum cum baccis rubi ideœi*).

NEW MODE OF REDUCING MERCURY TO FORM A FERRUGINATED PILL OF MERCURY.*

BY G. F. COLLIER, M.D.

THE varying and unsatisfactory quality of our "blue pill," has for many years attracted attention. In my second edition of the "*London Pharmacopœia,*" I gave the outline of the formula for preparing it with sesquioxide of iron ; the further experience of years enables me to offer this preparation to the profession as a boon to them and to the public, for it may be proved that the iron enters along with the mercury into the blood, and saves the wear and tear of the human body under its use. I will not, at this time, canvass, because I doubt the probability of the sesquioxide (in double equivalents) yielding up one atom of its oxygen to the mercury, as is the opinion of several chemists to whom I have submitted this compound. I am aware that other peroxides, when moist, will similarly combine and divide mercurial globules ; and I will not now enter upon the series of incomplete experiments instituted by myself, to prove that mercury will amalgamate with other metallic oxides, and in this state form double or triple salts with acids. I shall now keep only to the practical utility of my compound, and to its importance as a great remedial improvement.

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* From *The Lancet*, March 11, 1843.

In the spirit of a pharmaceutical chemist, I should either exclusively manufacture and sell it over my own counter, or I should take out a patent for it ; in that of a manufacturing chemist, I should do the like, or keep it a secret and save a fortune by it ; were I of the new school of "*summi auctores*," I should throw the mere shadow of it, chemical, mesmerical, magnetical, and homœopathical, into a modest pamphlet, proving that the era of medicine truly commenced in 1843, and that up to that time all were shadows, clouds, and darkness. I shall content myself with publishing the recipe, and recording a brief statement of my experience.

℞ *Ferri sesquioxidi*, ʒj ;
Hydrargyri, ʒij ;
Confect. rosæ Gallicæ, ʒiij.

Contere donec globuli non amplius conspiciantur.

It is made in five minutes ; common blue pill demands a week. The globules are not visible, even by the microscope. It is uniform in its appearance and effects. It makes a smoother pill, retaining its form more permanently. It salivates in a few days in the usual doses. The presence of iron prevents the wear and tear of the human body under the effects of the mercury. It is particularly eligible for the strumous, the irritable, and for reduced anæmial constitutions requiring mercury. The powers of life are not so much (scarcely at all) prostrated under its use. Its resolvent power is greater than that of mercury alone, especially with respect to buboes. Practitioners will at all events know what they are using ; at present they have for blue pill all manner of alloys and sulphurets,—mercurial zinc pill, mercurial sulphur pill, &c. &c. &c.

Five gains of sesquioxide will suffice to amalgamate and divide a large quantity of mercury, but I propose the larger proportion as a remedy.

ON THE DETECTION OF THE ADULTERATIONS OF THE DIFFERENT CHEMICAL AND PHARMACEUTICAL PRODUCTS.*

BY GIOVANNI RIGHINI.

MEANS OF DETECTING THE ADULTERATION OF EXTRACTS IN GENERAL.

In the present state of science, there exists no character sufficiently distinctive to enable us to decide positively, whether a given extract arises from one kind of plant or another, particularly when it is required to distinguish the extracts prepared with the vegetables called *narcotic*. The special odor of the plant affords, it is true, an approximative means of deciding whether an extract is furnished by hemlock, stramonium, belladonna, lactuca virosa, hyosciamus, nightshade, &c. But the employment of such a characteristic requires a long experience in the different modes of preparation of the extracts themselves, and a very accurate remembrance of the odor of each vegetable.

The following means have always been successful with me in the examination of extracts, whenever I have attempted to detect their adulteration. I prepare a solution of any extract in distilled water, and I add $\frac{1}{20}$th of dilute sulphuric acid. The odor of the plant is immediately developed. It is in this manner only that it is possible to appreciate the characteristic differences of narcotic extracts.

ADULTERATION OF COMMERCIAL SUBCARBONATE OF SODA, AND ON THE MEANS OF ASCERTAINING THE PURITY OF THIS SALT.

In general, the chemical preparations which are met with in commerce, are never absolutely pure. Latterly I have seen basic carbonate of soda, of fine appearance, under the form of white efflorescent lumps. Wishing to assure myself of the perfection of this product, I found it mixed with much sulphate of soda. The means which appear to me to be used for effecting this adulteration, are the following : both the subcarbonate and the sulphate of soda are susceptible of undergoing aqueous fusion ; they are simultaneously fused, and when they are arrived at a state of perfect and quite homogeneous fusion, they are run into a receiver, in which, by cooling, they are converted into a hard mass, which is broken.

Among the means which we possess of detecting the presence of sulphuric acid, whether free or combined, chloride of barium ranks first; but, in the case in question, this salt is not adapted for promptly detecting the adulteration. The following are the means which I employ for quickly appreciating the quantity of sulphate of soda contained in a given quantity of subcarbonate of soda thus adulterated.

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* *Journal de Chimie Médicale*, March, 1843.

I take 5 grammes of suspected subcarbonate, which I reduce to powder and place in a porcelain capsule; I afterwards add pure acetic acid until it ceases to produce effervescence. The salt not dissolved by the acetic acid is sulphate of soda, which, dried and weighed, gives the proportion in which it was found mixed with the subcarbonate.

ADULTERATION OF ACETATE OF MORPHIA.

The commercial value of acetate of morphia being comparatively superior to the sulphate of the same base, the cupidity of the fraudulent has been excited, and some of them have been able to sophisticate this salt in such a manner as to deceive the most practised eye.

I have met with dry acetate of morphia, which, examined by means of the soluble salts of baryta, has been ascertained to be nothing more than sulphate of morphia mixed with a few traces of acetic acid.

In order to discover the means employed in this adulteration, I have made some experiments, and I have ascertained that sulphate of morphia is dissolved in hydrated acetic acid, and that by the evaporation of the solution, a salt perfectly analogous to that mentioned here is obtained.

ADULTERATION OF ERGOT OF RYE.

It is not unimportant to know that wheat, by the effect of organic changes, produces a grain which is very analogous to ergot of rye; this resemblance is only apparent; the difference is readily perceived by examining the interior of this grain, which is black, whilst the interior substance of ergot of rye is characterised by its whiteness.

ADULTERATION OF THE SYRUPS, OF GUM, OF MARSH-MALLOW, AND OF MARSH-MALLOW FLOWERS, BY SIMPLE SYRUP.

Many traders are in the habit of furnishing simple syrup instead of the above-mentioned syrups. The absence of the gummy or mucilaginous principles, is easily ascertained. For this purpose, it is sufficient to pour a little of the syrup into a test-glass, to dilute it with a little water, then to add to the mixture, alcohol at 40°. If a gummy or mucilaginous precipitate be not immediately formed, it is certain that the syrup is nothing more than simple syrup. (This means has already been pointed out.)

ADULTERATION OF PHLORIDZIN.

Since it has been demonstrated that crude phloridzin is more active than pure phloridzin, the means of adulterating it have been found, without prejudice to the object which physicians have in view.

The crude phloridzin of commerce is sparingly soluble in water and alcohol, and it has an intensely bitter taste.

As this product arrests intermittent fevers, with more certainty than pure and crystallised phloridzin, I thought that it might contain quinine. I therefore took 16 grammes, which I dissolved in water slightly acidulated with sulphuric acid, and filtered. The liquid obtained was very bitter; I evaporated it to a pellicle, and it yielded a salt which, from its physico-chemical characters, I recognised as sulphate of quinine.

The undissolved portion was washed with alcohol, then dissolved in boiling water, and the solution, evaporated to dryness, yielded a substance presenting all the characters of gum kino.

This adulteration, which is quite new, appears to me to deserve attention.

The characters by which the purity of crude phloridzin may be ascertained, are as follows:—It is soluble in water and in alcohol, but insoluble in the dilute acids. The solution of phloridzin should not render turbid those of the salts of baryta. The persalts of iron give rise to an olive-colored precipitate, in the solution of phloridzin.

The examination which I have made of the surreptitious crude phloridzin shows that it was formed of a gramme and a half of sulphuret of quinine, to 16 grammes of gum kino.

ON THE GURJUN BALSAM.*

BY DR. O'SHAUGHNESSY.

DR. O'SHAUGHNESSY, a gentleman of high chemical knowledge, to whom the editing of the *Bengal Dispensatory* was entrusted, has introduced to our notice some indigenous remedies as substitutes for drugs in general use, which are only to be obtained from foreign countries. Among these is the gurjun balsam, the essential oil of which has been found to be nearly equal to the balsam of copaiba in the treatment of gonorrhœa. Some obstinate cases of chronic gonorrhœa and gleet, which had long resisted copaiba and cubebs, have been cured by this remedy. The balsam itself varies in consistence from that of thick honey to a light oily liquid. As found in the bazaar, it generally occurs as a brown, oily, semi-transparent liquid, possessing a sp. grav. 0·962. It is totally insoluble in water, freely in warm alcohol, and with difficulty in ether. By distillation, from 35 to 40 parts per cent. of essential oil are obtained, and a thick resin remains in the retort. The pure essential oil is transparent, and nearly colorless, of sp. grav. 0·934: it is soluble in alcohol, ether, naphtha, and the essential and fixed oils. It dissolves caoutchouc, copal, vateria resin, and solid gluten. Its savour is acrid, sweetish, and heavy, and its odor closely resembles that of the essential oil of copaiba. It is administered in the dose of 10 to 30 drops, three or more times in the day. It generally causes a sensation of warmth at the epigastrium, eructations, and sometimes slight purging, and it communicates a strong smell of turpentine to the urine, which it increases remarkably in quantity.

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* *Medical Times.*

EXTRACT OF GUNJAH (INDIAN HEMP) IN TRAUMATIC TETANUS.*

BY A. GRAHAM, ESQ.

Two cases of traumatic tetanus were treated mainly by this medicine, in the one successfully, in the other with advantage. Dugreah, a boy, aged 13, was admitted with a lacerated wound of the right leg on the 15th of February, 1841. On the 25th, he began to complain of some stiffness and pain of the jaws, difficulty of swallowing, &c., which increased gradually in degree to the 1st of March, when the muscles of the neck became affected. He was put upon the extract of hemp, having a grain every second hour, and the dose was increased in a couple of days to two grains; he was now completely under the narcotic influence of the medicine; the tetanic spasms and other symptoms then began gradually to abate, and he finally recovered, and was discharged on the 21st of April.

Case 2.—Ramah Sootee, a thin, spare man, was received, laboring under violent tetanic spasms of the whole body, and rigidity and stiffness of every part. The symptoms had come on three days before, and were traced to a puncture in the sole of the left foot from a nail, received nine days previously. He was put upon the extract of hemp immediately, and in the first instance with great relief to his sufferings—indeed, with permanent and very marked diminution of the intensity of the tetanus throughout, but the patient gradually sank exhausted, and died.—*Trans. Med. and Phys. Soc. Bombay.*

ON CRINUM ASIATICUM, AS A SUBSTITUTE FOR IPECACUANHA.*

The fresh bulbs of the *crinum asiaticum*, a plant common in Bengal, and often cultivated in the gardens, have been found serviceable; indeed, it is said to be the only indigenous emetic plant met with abundantly, which does not produce griping, purging, or other distressing symptoms. From two to four drachms of the fresh root, bruised into a paste, and squeezed, will furnish a juice, which becomes emetic after a few minutes, and in smaller doses nauseant and diaphoretic. The dried sliced roots are efficient, but the dose must be doubled: the extract, whether aqueous or alcoholic, is uncertain in its action. The powdered seeds of the *ipomœa cœrulea*, in the dose of from 30 to 40 grains, act as a quick, safe, and pleasant cathartic. The alcoholic extract, which consists of resin and oil, is deep brown, ductile, of excellent pillular consistence, and keeps for several months. In ten-grain doses it produces the effects of jalap with certainty and speed; the taste is scarcely perceptible.

ON ARTEMISIA ABSINTHIUM.*

BY DR. COULTON.

Dr. H. Coulton has strongly recommended certain preparations of the *artemisia absinthium*, the plant being a grateful bitter and tonic. It has had numerous medicinal properties attributed to it, the chief of which are antiseptic, anthelmintic, deobstruent, tonic, and stomachic. An infusion made with half a drachm of the dried herb (freed from the stalk), and ten ounces of boiling water, allowed to stand for an hour, will produce an infusion of sufficient strength: the dose, an ounce and a half three times a day. The tincture is superior to any other preparation, and is made in the following manner:—Take 2 ounces of the dried herbs, free from the stalk, and 16 ounces of rectified spirit; macerate 12 days, and strain. This has a most beautiful green color, but fades on keeping, and it possesses the full aroma of the plant, and the bitter flavor in a high degree: 10 or 15 minims will impart a strong flavor to 2 ounces of water, and form a good stomachic draught. Wormwood is an aromatic tonic, well suited to various cases of chronic disease, in which it is desirable to support the tone of the stomach. Where debility of the digestive organs has been the chief feature of the disease, its adaptation has been evident, from the happy results that have followed its administration.

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* *London and Edin. Monthly Journal of Medical Science*, March, 1843.

* *Bengal Dispensatory.* † *Med. Times*

ON TALLICOONAH OIL.

Mr. Clarke, the senior assistant surgeon to the colony of Sierra Leone, has published a communication on the Tallicoonah or Kenduh oil, which is used by the liberated Africans as an anthelmintic and cathartic. The best specimens are liquid, but it is more generally found concrete. The dose is from one to two ounces, thrown up as an enema. In over-doses, it produces the most violent hypercatharsis, cold sweats, and vomiting, succeeded by collapse; and, if remedial means are not promptly employed, even by death. Mr. Clarke says it is injurious in persons of a weak habit of body; but, to others, he can confidently recommend it as a safe and powerful anthelmintic.

ON SOME OF THE LAWS AFFECTING CHEMISTS AND DRUGGISTS.

To the Editors of The Chemist.

March 15, 1843.

Gentlemen,—

Circumstances of late have shown how necessary it is for us to look about us, seeing that many of the trade have been made victims to the informer. No one ever contemplated liability to a penalty for selling that which has been hitherto sold by him as an essential article in his business, but which, it is now proved, cannot legally be sold without a licence: however the question is in abeyance at present, and it is supposed and hoped that the penalties already imposed will be remitted, and the law on the point properly defined. I would suggest that Sp. Vini might be sold, *as medicated*, if a few grains of camphor were added to it, the same as if made into tincture with any other ingredients; of course, in small quantities; because, if this is not allowed, we might as well shut up our shops at once. Perhaps, Gentlemen, you will be good enough to give your readers your interpretation of the law on the subject,—it being so important to all in business.

But, Gentlemen, are we not also liable to information on other matters in the trade? We ought to be aware of the penalties attached to the sale of at least a dozen kinds of lozenges, which the law deems medicinal, and cannot therefore be legally sold without being stamped. Then, again, as regards the sale of smelling bottles with *silver tops*, if they exceed a certain weight, we are liable to a penalty for not taking out a silver licence: and finally, I would allude to the heavy penalty existing for not taking out a licence for the sale of patent medicines. This law requires revision, inasmuch as it operates very unfairly and unjustly, which I have pointed out fully in a letter on the subject in a former Number of The Chemist.

These things are peculiarly fitted for the interference of that body which considers itself as the "*ne plus ultra*" of the trade; and surely, if as solicitous in assisting their constituents towards a repeal or revision of these evils, as they are to enrol them as subscribers of two guineas annually, they will at once set their shoulders to the wheel, and show that they do something for their money, otherwise neither the appendage of letters *bought* at the end of their names, nor even the Queen's Charter, will satisfy them, I should imagine; they would not me, at all events, if I were one of them.

I am, Gentlemen,
Respectfully yours,
Patrioticus.

RELATION BETWEEN THE SOLID CONTENTS AND THE DENSITY OF URINE.*

BY DR. GOLDING BIRD.

The following Table exhibits the relation which subsists between the *dry* solid contents and the density of urine.

Specific Gravity.	Water in 1000 gr.	Solids in 1000 gr.
1001	998·35	1·65
1002	996·7	3·3
1004	993·4	6·6
1006	990·1	9·9
1008	986·8	13·2
1010	983·5	16·5
1012	980·2	19·8
1014	976·9	23·1
1016	973·6	26·4
1018	970·3	29·7
1020	967·0	33·0
1022	963·7	36·3
1024	960·4	39·6
1026	957·1	42·9
1028	953·8	46·2
1030	950·5	49·5
1032	947·2	52·8
1034	943·9	56·1
1036	940·6	59·4
1038	937·3	62·7
1040	934·0	66·0
1042	930·7	69·3
1044	927·4	72·6
1046	924·1	75·6

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* *Medical Gazette*, Feb. 10, 1843.

REMARKS ON THE CALCULI IN ST. GEORGE'S HOSPITAL.*

BY DR. BENCE JONES.

(*Communicated to the Medical and Chirurgical Societies, by Mr. Cæsar Hawkins.*

The number of specimens submitted to examination was 233. The author's object, from the analysis of these calculi, is to arrive at conclusions with regard to the comparative frequency of different states of the urine in calculous complaints, and thus to obtain practical hints as to the efficacy of remedies intended to alter the secretion, or act upon the stone in the bladder. He presents several tables: and taking 450 states of the urine, inferred from the composition of the calculi, finds that, in 139, it was alkaline, and in 311 acid, to test paper. Omitting from the latter test 59 specimens of oxalate of lime, 252 cases of the uric acid diathesis remain; and in 117 of them, no free acid was passed, from which the author concludes that alkalis would have been of no benefit to them, so far as neutralising acidity of the urine was concerned. Taking the cases in which the alkaline concretions prevailed, he infers that in 52 the calculus might have been lessened by the injection of dilute acids, and in 12, the whole calculus might have been removed; while in others to which he refers, disintegration might have been effected. He concludes by describing a calculus in Mr. Cæsar Hawkins's possession, the nucleus of which consists of cystine, and which, from the history, appears to have been formed when the patient was 2½ years of age.

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* *Medical Gazette*, March 10th, 1843.

MESSRS. KNIGHT AND SON'S URINARY CABINET.

We have, at the invitation of Messrs. G. Knight and Sons, of Foster Lane, inspected their very useful and well arranged Cabinet; it contains every requisite for a chemico-pathological examination of urine and urinary concretions. Every medical practitioner should possess such a useful collection.

The *Guide*, by Dr. Venables, is an indispensable companion to the Cabinet, and is well written, and accurate, though simple, in its directions.

DR. HOPE AND PROF. LIEBIG.

The *Gateshead Observer* mentions a report that Dr. Hope will retire from the chair of Chemistry in the University of Edinburgh, at the close of the present session, and be succeeded by Professor Liebig.

IV. REVIEWS AND NOTICES OF BOOKS.

THE AMERICAN JOURNAL OF SCIENCE AND ARTS. Conducted by Professor Silliman and Benjamin Silliman, Jun. Newhaven: B. and M. Noyes. London: Wiley and Putnam. January, 1843.

It may appear almost superfluous to notice a work which has so long occupied a high position in scientific literature wherever science is known and appreciated; but we are confident that our readers will excuse us in doing so, when we inform them that Messrs. Silliman, in a notice on their cover, request each of their subscribers to endeavor to obtain them additional subscriptions, offering to those who procure them four new subscribers a copy of their excellent periodical for the year—alleging as a reason the circumstance, that their subscription list has suffered severely from the general commercial pressure.

Among the more valuable contributions to this No., we may mention:—Remarks on the Formation of Fogs, by Prof. Carpenter; Remarks on the Common Methods of taking the Mean Temperature of Places, &c., by the same; Description of the Bones of a New Fossil Animal, of the Order Edentata, by Dr. Harlan. Botanists will read with delight the article—"Selections from the Scientific Correspondence of Cadwallader Colden with Gronovius, Linnæus, Collinson, and other Naturalists;" arranged for publication by Asa Gray, M.D. Some of the letters written in English by Linnæus and Peter Kalm will be read with interest by the curious. This No. also contains "A Description of a Carbon Voltaïc Battery," by B. Silliman, Jun.

We recommend this ably conducted periodical to those lovers of science who may desire to be made acquainted with the progress of science among our Transatlantic brethren.

ON THE CHEMICAL DISCRIMINATION OF VESICAL CALCULI. By E. A. Scharling, A.A., L.L.M., Professor of Chemistry in the University and Polytechnic School, Copenhagen. Translated from the Latin, with an Appendix, containing Practical Directions for the Recognition of Calculi. By S. Elliott Hoskins, M.D. With Plates. London: John Churchill, Prince's Street, Soho. 1842.

A critique of Dr. Scharling's work, which appeared in the *British and Foreign Medical Review*, led Dr. Hoskins to obtain it, and condense and arrange it for his own use; and his experience of its value induced the regret, so natural to a liberal and enlarged scientific mind, "that its utility should be so narrowly circumscribed;" and, Dr. Scharling having placed the original woodcuts at his disposal, he was induced to bring within the reach of others a work from which he had himself derived so much benefit.

The practical utility of such a work as this must be evident to all who have devoted attention to the subject of urinary concretions. It is only by ascertaining the exact composition of calculi that we are enabled to set about devising means of dissolving them: therefore, to those who are philanthropically intent on discovering menstrua for their solution, the essay before us will prove a valuable practical guide.

Dr. Scharling's mode of classifying calculi is "a mere modification of that proposed by Dr. G. O. Rees." The difference consists in this: Dr. Rees divides them into two groups; the one destructible, and the other indestructible, by heat; but as many calculi consist of a mixture of destructible and indestructible matter, and as much difficulty is thus thrown in the way of the inexperienced analyst, Dr. Scharling, to obviate this inconvenience, has raised a third class—"the partially combustible."

The translator, in order to simplify the recognition, both of groups and of individual calculi, has added the blow-pipe characters of each variety. "They are so distinctive as to supersede, in most cases, the necessity of having recourse to further chemical examination."

It is scarcely necessary to enter into the plan of this work: suffice it to say it treats; 1st, of the physical characters of calculi; 2nd, of their constituents; 3rd, of their classification; 4th, of the discrimination of calculous constituents; 5th, of the origin and increment of calculi; 6th, of solvents for the stone. 7. A Catalogue of Calculi in the Surgical Museum of Copenhagen is also given. The Appendix details the action of various reagents on urinary concretions, and gives copious directions for their recognition. Tables of the distinctive characters of calculi, and of the principal diseases incident to the urine, (the latter by Dr. Marshall Hall,) conclude the work.

The plates are only tolerable.

The references to the plates render it difficult to select an extract.

The following will be interesting to our readers:—

CLASSIFICATION OF CALCULI.

"Various methods of classifying urinary concretions have at different times been devised; some founded on their sensible properties, and others on their chemical composition. The most natural arrangement, however, seems to be that in which not only the whole of the constituents are enumerated, but also the order of their succession. In order to facilitate their identification, it is necessary to class them according to their chemical properties. In the following pages both these plans have been adopted.

"It will be found, in the accompanying table, that the ingredients forming the nucleus have been arranged in the first column; in the second, those constituting the body, or principal mass; and in the third, the material of which the cortex, crust, or external covering, is composed. When the latter coincides in composition with that of the principal mass, a blank space has been left.

"This kind of subdivision seems to be pointed out by the structure of the calculi themselves, and should never be neglected by those who seek to analyse them. The external layers of a calculus frequently bear but a small proportion to the whole, and differ in composition from the rest of the mass: mere inspection, therefore, will convey little real information as to their nature; nor can the examination of a powder, filed off from the sectional surface of a calculus, give a just idea of the proportions in which the different ingredients exist.

"It is much to be feared that, from neglecting these precautions, many tables of the comparative frequency of different varieties of calculi have been drawn up on false principles.

TABLE OF VESICAL CALCULI.

	NUCLEUS.	PRINCIPAL MASS.	CORTEX.	No.
1	Uric acid	Uric acid	Uric acid	32
2	,, ,,	Uric acid and urates of ammonia alternating	Urate of ammonia	1
3	,, ,,	Uric acid	Phosphate of magnesia	13
4	Urate of ammonia	Urate of ammonia		3
5	Urate of soda	Uric acid		1
6	Urate of lime	Urate and oxalate of lime, and urate of ammonia		1
7	Oxalate of lime	Uric acid		3
8	,, ,,	Uric acid and phosphates mixed		1
9	Triple phosphate	Triple phosphate		8
10	Fusible matter	Fusible matter		6
11	Urate and oxalate of lime	Oxalate of lime		8
12	,, ,,	,, ,,	Phosphates	13
13	,, ,,	Oxalate and urate of lime alternating	Phosphates	3
14	Urates of ammonia and lime	Urates of ammonia and lime alternating		2
15	Uric acid and urate of ammonia	Urate of ammonia and phosphate mixed		2
16	Uric acid and urate of lime	Oxalate of lime	Phosphates	2
17	,, ,, ,,	Phosphates		2
18	Uric acid, urate and oxalate of lime	Uric acid		27
19	Uric acid, urate of ammonia, and oxalate of lime	Phosphates		2
20	Uric acid, urate and oxalate of lime	Uric acid	Phosphates	17
21	Silica	Silica		1
22	,,	Carbonate of lime		1
23	Foreign materials	Phosphate of lime		2
24	No nucleus	Phosphate and carbonate of lime		1
25	,, ,,	Phosphates		2
26	,, ,,	Fibrinous matter and phosphates		1
			Sum Total of Calculi	155

Thus, in 94 the principal mass is uric acid = 60 per cent. $= 1 : 1\frac{2}{3}$
23 ,, ,, oxalate of lime = 15 ,, $= 1 : 6\frac{2}{3}$
25 ,, ,, phosphates = 16 ,, $= 1 : 6\frac{1}{4}$

"If the above comparisons had been deduced from external inspection alone, the predominance would have been in favor of the phosphates, instead of the urates. It will be seen that, 73 specimens coated with the phosphates, *i. e.* 47 per cent., or $2\frac{6}{74}$, are in fact chiefly composed of uric acid and its modifications.

"For the following tables, showing the comparative prevalence of the different species of calculi in various collections, I am indebted to Martin's *Commentatio Medica de Lithogenesi*.

Proportions between the Oxalates, Urates, and Phosphates.

1. Hunterian Museum	= 1 : 13·5 =	1 : 2·46	= 1 : 2·0
2. Guy's Hospital . .	= 1 : 3·0 =	1 : 4·0	= 1 : 3·0
3. Wood's Collection* .	= 1 : 3·0 =	1 : 1·18	= 1 : 7·0
4. Norwich Hospital .	= 1 : 2·9 =	1 : 1·3	= 1 : 7·6
5. Marcet	= 1 : 3·0 =	1 : 2·7	= 1 : 3·2
6. Manchester . . .	= 1 : 10·33 =	1 : 2·2	= 1 : 8·5
7. Bristol	= 1 : 3·33 =	1 : 3·33	= 1 : 10·89
8. Swabia (Rapp) . .	= 1 : 1·43 =	1 : (11·5) 1·21	= 1 : 10·1
Total (1400) . .	= 1 : 4·0	1 : 1·87	= 1 : 1·5

"Crosse has also given a table of the comparative composition of small calculi voided through the urethra.

Uric acid and urate of ammonia . .	72
Uric acid and oxalate of lime . .	9
Oxalate of lime	14
Carbonate of lime	1
Triple phosphate	2
Fusible	2
	100

"The small number of phosphatic calculi included in this last list, confirms the opinion, previously expressed, that the phosphates are chiefly deposited as an external coating on calculi of large size.

"Having, in the preceding section, treated generally of the physical, as well as chemical properties of vesical calculi, I shall now proceed to classify them, and to give more detailed instructions for the separation and examination of their various constituents.

"The classification I propose, is founded on the changes which are produced on calculous concretions, by exposing them to a high temperature.

"The effect first produced on a fragment exposed to the blow-pipe flame is, that it becomes charred, owing to the combustion of the animal matter calculi always contain.

"If the heat be continued, or augmented, one of the following conditions is fulfilled:—

"1st. The fragment gradually consumes, leaving no residuum, or a very slight one.

"2nd. The fragment does not consume; it either whitens after being charred, and remains unchanged, or it fuses into a bead.

"3rd. The fragment partially consumes, leaving a considerable proportion of residuum.

"These obvious differences of behaviour, under parallel circumstances, naturally suggest the division of calculi into three classes.

"Class 1st. Combustible Calculi, which consume on being sufficiently heated, leaving a very minute residuum.

"Class 2nd. Non-combustible Calculi, which do *not* dissipate under calcination.

"Class 3rd. Partially combustible Calculi, which, after combustion, leave a considerable proportion of residuum.

"The 1st Class includes the following orders:—

a. Uric acid.
b. Uric oxide.
c. Cystine.
d. Combinations of the three preceding, with each other, or with other combustible materials, such as ammonia, &c.

"The 2nd Class includes the following orders:—

a. Phosphates.
b. Carbonates.
c. Silica.
d. Mixtures of the preceding.

"The 3rd Class includes the following orders, namely, compound calculi formed by the combination of the species contained in the two former classes.

a. The residuum consisting of the phosphates.

b. The residuum consisting of carbonate, or caustic bases.

c. The residuum consisting of phosphates, with carbonate or caustic bases.

d. The residuum consisting of accidental ingredients, either alone, or mixed with the foregoing.

"The objection urged against this sort of arrangement is, the necessity it involves, for having recourse to experiments, for the mere purpose of classing the calculus. But, it should be remembered, that if accuracy is desirable, chemical investigation must, ultimately, be resorted to; these simple experiments, therefore, are not only so many preliminary steps in the analysis, but in themselves convey so much collateral information, as frequently to do away with the necessity for further inquiry.

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* "Woode Collectionibus Scholæ in Windmill Street, Conditæ. *Lond. Med. and Phys. Journal*, No. LVII. p. 29, January 1827."

"It would certainly be more speedy and more convenient, if a useful classification could be framed, from the aspect of calculi alone; but as this does not denote their internal structure, the most accurate inspection, although it may aid, can never supersede chemical examination."

LITERARY ANNOUNCEMENT.

We are glad to find that a Journal devoted to Dental Surgery is to be published on the 1st of April. It is edited by Mr. Robinson, who has long been known to the profession as a lecturer and operator. Conducted by one so well fitted by his pursuits for the task, the *Quarterly Journal of Dental Surgery* cannot fail to arrive at a considerable circulation among scientific dentists, medical practitioners, and chemists, many of whom practise as dentists.

TO CORRESPONDENTS.

"J. R. C., Manchester."—We will write to you, with what you require.

"A Subscriber from the Commencement," who inquires of us respecting Alpacas, and the adulteration of Guano, had best give us his address, that we may write to him privately.

"A Reader."—We could better answer you by letter.

Numerous Correspondents who write to us on the subject of the Charter of the Pharmaceutical Society, are informed, that they have nothing to apprehend from not joining the Society. If they belong to it, they will lose their money; if they do not, they will save their money and lose nothing else.

"A. B."—You are wrong.

"X. Y. Z."—Decidedly not.

"An Old Correspondent."—We recommend the use of the native sulphuret.

"Dr. R——" shall hear from us privately, before the 10th of April, with the information he requires.

"A Transatlantic Subscriber" will observe our answer in the next No.

"R. S."—Why? write and tell us; *we* will help you.

"A Subscriber, Dublin."—Not that we are aware; however, we will be on our guard.

Erratum in No. XXXIX.

In the Review of Dr. Willis on Stone, page 140, col. 1, line 28 from the bottom, for "Chemical Means," *read* "Mechanical Means."

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN FEBRUARY, 1843.

BY. E. THOMPSON.

BAROMETER.

Monthly mean	29·46
Mean at 9 A.M.	29·44
Mean at 3 P.M.	29·46
Mean at 9 P.M.	29·48
Maximum on 7th	30·05
Minimum on 3rd	28·88
Range	1·17

THERMOMETER.

Monthly mean	35°
Mean of maxima	40
Mean of minima	30
Maximum on 1st	53
Minimum on 15th	17
Range	36

WIND.

	Days.		Days.
N.	0	S.	0
N.E.	4	S.W.	2
E.	7	W.	7
S.E.	5	N.W.	3

RAIN.

1·92 inches.

WEATHER.

	Days.		Days.
Clear	2	Frost	16
Cloudy	3	Lunar halo	0
Overcast	1	Hoar frost	0
Showers	5	Mist	1
Rain	9	Hail	5
Snow	12	Lightning	1

GENERAL REMARKS.

The pressure of the atmosphere has been more equable than it has been for some months. The mean of the barometer is low, and the weather has been for the most part wet. Snow has fallen on 12 days, and frost has occurred during 16.

A low temperature continued for some time about the middle of the month, and the river was frozen over for the first time this winter.

Measles have prevailed very extensively here, and in many surrounding towns, and a greater than average number of cases of typhus have occurred.

Nota Bene.—*All Communications and Books for Review must be addressed "To the Editors of the Chemist, Care of Mr. Hastings, Publisher, 13, Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON SOME SEPARATIONS OPERATED BY MEANS OF SULPHUROUS ACID OR THE ALKALINE SULPHITES.*

BY M. P. BERTHIER.

Sulphurous acid and the alkaline sulphites have long been employed with advantage in many docimastic operations. I have myself pointed out some of their uses, and have shown particularly: 1. That by means of sulphurous acid, oxides of zirconium and titanium are easily procured perfectly pure, notwithstanding the difficulty of removing the last traces of iron: 2. That chrome may easily be separated from iron, and alumina from glucina, &c.; and on this occasion, I have investigated the action of sulphurous acid on the most common metallic sulphurets, and on some oxides. I have since found that this reagent, whether free, or in the state of combination with alkalis, was susceptible of new applications, which appear to me capable of simplifying many analytical operations. I am about to make known these applications, first succinctly indicating the properties of the principal sulphites.

The sulphites of baryta and strontia are almost insoluble in water, and very sparingly soluble in sulphurous acid.

Sulphurous acid easily dissolves even native carbonate of lime. Sulphite of lime is scarcely more soluble in water than the sulphate; it dissolves in great quantity in sulphurous acid; but when the solution is boiled, the greater part separates in the state of granular crystals.

Calcined magnesia easily dissolves in sulphurous acid, even without heat; the liquor does not become turbid by boiling, and if it be heated or spontaneously evaporated, it furnishes transparent prismatic crystals of sulphite.

Yttria, in the state of hydrate or carbonate, dissolves in sulphurous acid, and the solutions of its salts are not rendered turbid, cold, by the alkaline sulphites; but if they be boiled, the whole of the earth is precipitated in the state of subsulphite completely insoluble in water, but soluble in sulphurous acid.

Glucina acts with sulphurous acid like magnesia, and its solutions are not rendered turbid by boiling.

Alumina dissolves in sulphurous acid, but only when it is in the state of humid hydrate; it is afterwards completely precipitated from the liquor by boiling, and the deposit is a hydrate and not a subsulphite. This hydrate is gelatinous, easy to filter and wash, and, after it is dried, it is pulverulent, opaque, and of a fine white. The alkaline sulphites supersaturated with acid do not render the salts of alumina turbid, without heat, but, when boiled, all the earth is separated. When an excess of ammonia is poured into a solution of sulphite of alumina, a considerable portion of the earth at first precipitated is redissolved; but the dissolved portion is again precipitated by boiling.

When a solution of phosphate of alumina is boiled with sulphite of ammonia, all the phosphate is precipitated. But if a solution of arseniate of alumina be treated in the same manner, only perfectly pure alumina is precipitated, and all the arsenic remains in the liquor in the state of arsenious acid.

Zirconium and titanic acid dissolve only in very small quantity in sulphurous acid, and the dissolved portion entirely separates from the liquor by boiling. The solutions of zirconium and titanium are not rendered turbid, without heat, by sulphite of ammonia; but when boiled until there is no longer any odor of sulphurous acid, the two oxides are completely precipitated; they are both then easy to filter, and, after they have been washed with warm water, they do not retain a perceptible quantity of sulphurous acid.

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* *Annales de Chimie et de Physique*, January, 1843.

† *Annales de Chimie*, tome LI. p. 191.

The ammoniacal carbonate of uranium readily dissolves, without heat, in sulphurous acid, and, when the liquor is boiled, all the uranium separates in the state of granular subsulphite, of a fine yellow. The yellow solutions of uranium are likewise decomposed by sulphite of ammonia by aid of ebullition; but they are not rendered turbid by that reagent, without heat.

When an excess of sulphurous acid is added to a solution of tungstate of ammonia, the latter undergoes no alteration; and if the liquor be supersaturated with sulphuric acid, the tungstic acid is precipitated without the sulphurous acid causing any change in its aspect, even with heat.

Molybdate of ammonia acts otherwise; sulphurous acid causes it to become of a very fine blue in a very short time, but no precipitate is formed in the liquor, and it may be boiled in a close vessel without becoming turbid or discolored.

To dissolve the hydrate or carbonate of chrome in sulphurous acid, it must be suspended in a large quantity of water, and the liquor must be supersaturated with acid: this liquor is green. It is decomposed by boiling, and deposits the chrome which it contained in the state of granular and green subsulphite; ammonia does not render it turbid, any more than the alkaline carbonates; but these reagents communicate to it a faint wine color, similar to that of acetate of chrome. The alkaline sulphites do not precipitate the salts of chrome, even by aid of prolonged boiling.

When sulphurous acid gas is passed into a solution of neutral chromate of potassa, there is formed in it a considerable brown deposit of deutoxide of chrome; then the deposit turns green, and gradually redissolves, and we have finally a green liquor which contains sulphuric acid, hyposulphuric acid and sulphurous acid. On boiling this liquor, all the sulphurous acid is disengaged, and the chrome is almost entirely precipitated in the state of subsulphite of protoxide. Sulphurous acid immediately colors green the solutions of alkaline bichromate without rendering them turbid, and changes them into a mixture of sulphate and hyposulphate of chrome: no precipitate is formed by boiling.

The carbonate of cerium, as obtained by means of cerite, dissolves without difficulty in sulphurous acid. The salts of cerium are not rendered turbid, without heat, by the alkaline sulphites, but, by aid of ebullition, these salts are completely decomposed, as well as the pure sulphite, and all the metal is separated from it in the state of granular, white subsulphite, quite like yttria. If, besides cerium, there really exist in cerite two other metals—*lantanium* and *dydinium*, it follows that all these three metals act in the same manner with sulphurous acid.

It is known that, in dissolving in nitric acid, all the oxides of manganese superior to the protoxide give a mixture of sulphate, hyposulphate and sulphite. In order to obtain the sulphate pure, the carbonate must be employed: the latter is completely dissolved in an excess of sulphurous acid; but if this excess be driven off by heat, a subsalt is precipitated which is sparingly soluble in water, but which easily redissolves in sulphurous acid. The solutions of manganese are not rendered turbid, cold, by sulphite of potassa; but, at the boiling temperature, they act with this reagent like pure sulphite. On the contrary, when sulphite of ammonia is added to those solutions, they are not rendered turbid, however long they may be boiled.

Iron, in the state of humid hydrate of peroxide, immediately dissolves in sulphurous acid: the native hydrate itself is appreciably soluble in it. The liquor, at first red, is afterwards almost entirely decolored. When an alkaline sulphite is poured into the solution of a salt of peroxide of iron, the liquor also immediately becomes of an intense red, even when it is very dilute; but it is almost instantaneously decolored when heated, and this decoloration is effected even without heat, spontaneously, in a very short time; sulphuric acid is formed, and the iron is reduced to the state of protoxide. The solutions are not rendered turbid by boiling, when the contact of the air is avoided; but if, after the excess of acid has been expelled. they be left exposed to the atmospheric action, there very speedily separates, especially with heat, a substance of a brown-red which must be a subsalt of peroxide of iron, and the liquor itself becomes perceptibly red.

The solutions of sulphite of iron are only partially precipitated by ammonia, and it appears even that they are not at all precipitated when they are sufficiently acid; but after the addition of ammonia, the iron is completely precipitated by the hydrosulphates, which would not have been the case with the pure sulphite, because a soluble hyposulphite would be formed.

The moist phosphate of peroxide of iron dissolves by the aid of heat in sulphurous acid and sulphite of ammonia, but slowly and with difficulty. If sulphite of ammonia be added to a solution of phosphate of iron, a great part of the latter is at first precipitated, but it is gradually redissolved by boiling. However, it is better to bring it first to the state of phosphate of protoxide by the addition of a sufficient quantity of sulphurous acid to the liquor; after that the latter is not rendered turbid by the sulphite of ammonia either with or without heat.

The arseniatc of peroxide of iron acts like the phosphate, with this difference, that it is more easily soluble, because sulphurous acid and the sulphites promptly convert it into arsenite of protoxide.

The salts of cobalt and nickel are not rendered turbid by the sulphite of ammonia, even after long boiling; but with sulphite of potassa and boiling they are partially decomposed: however, a very large proportion of oxide remains in the solution. The deposit is a subsulphite which appears to become more and more basic by washing, as is observed with a great number of insoluble sulphites.

Liquid sulphurous acid acts, without heat, on the calcined deutoxide of copper, but slowly and feebly, and the liquor perceptibly acquires a green color. On heating it, the action is very prompt, and there is produced at once a blue liquor containing only sulphate of deutoxide of copper and an insoluble, scaly, crystalline substance, of a very fine cochineal red, which is equivalent to 0·8 of the deutoxide employed. By pouring sulphurous acid on artificial or native carbonate of copper, it is dissolved with effervescence, and a liquor is obtained which contains sulphite of deutoxide of copper: but this salt is gradually spontaneously decomposed at the ordinary temperature, especially under the influence of the solar light, and very rapidly if heated ever so little. The liquor becomes blue, and contains only neutral sulphate of deutoxide, and it constitutes a scaly red precipitate.

Sulphurous acid does not alter the salts of deutoxide of copper either with or without heat; the alkaline sulphites cause them immediately to turn green, which leads us to believe that sulphite of deutoxide is formed; but it does not produce any precipitate instantaneously. If the solution be afterwards left to itself, it is gradually decomposed, and the same decomposition is very rapidly effected if it be boiled. From this decomposition results a heavy, granular, crystalline, brilliant deposit, of a very fine cochineal red, and, if the alkaline sulphite be in excess, scarcely any copper remains in the liquor.

This red deposit is sulphite of peroxide of copper, a little hydrated, as M. Chevreul has already shown. Heated in a retort, this salt yields water, sulphurous acid and protoxide of copper of a rather deeper red. Exposed to the action of damp air, it is gradually altered and is converted into a mixture of neutral sulphate and subsulphate of deutoxide: it is nearly insoluble in water, but it dissolves in sulphurous acid; ammonia and muriatic acid likewise dissolve it; but sulphuric acid, even dilute and unassisted by heat, instantly decomposes it, and converts it into deutoxide, which is dissolved, and into metallic copper, which remains under the form of an extremely fine powder, of a deep red and without lustre, but which under the "burnisher" does not delay to present here and there bracteæ possessing a decided metallic lustre.

Protochloride of tin is precipitated without heat by the sulphite of ammonia, but not completely; in order that no tin may remain in the liquor, it must be boiled. The deposit obtained without heat is a subsulphite of a fine white: but by keeping this subsulphite in boiling water for a sufficient time, it abandons all its acid, and it is converted into anhydrous protoxide of a pale yellow. It is known, from the experiments of M. Girardin, that, in certain circumstances, sulphurous acid produces sulphuret of tin in acting on the chloride of that metal.

The tartrate of potassa and antimony (emetic) is not rendered turbid by sulphite of ammonia, even when the liquor is boiled for a long time.

Oxide of zinc is soluble in sulphurous acid; when the solution is boiled, it deposits a subsulphite which, by long boiling, appears to be decomposed, becoming less and less soluble. The salts of zinc are not precipitated by the sulphite of ammonia, even by aid of ebullition.

The sulphite of ammonia very promptly decomposes the deutochloride of mercury, by aid of heat; protochloride is first formed, which is deposited in small, pearly, crystalline bracteæ; then, if the heat be continued with a sufficient quantity of sulphite, the chloride becomes at first grey, then black, and finally it is completely reduced. The mercury, which commences by forming a sort of voluminous deposit, gradually contracts, but without acquiring any lustre. To make it unite in globules, it is necessary, as is known, to heat it with muriatic acid.

Nitrate of silver is precipitated by the alkaline sulphites, and even by sulphurous acid, in such a manner that only a very small quantity of silver remains in the liquor. The deposit of sulphite is granular, of a beautiful white, and perfectly similar in appearance to the chloride. It is insoluble in water, and almost insoluble in sulphurous acid; acetic acid does not decompose it, but the strong acids disengage from it sulphurous acid. It readily dissolves in ammonia. When it is boiled in water, or when it is dried on a filter at a heat approaching 100° C, it is converted into metallic silver and sulphate of silver.

It is completely and very easily reduced when an excess of an alkaline sulphite is added to the water in which it is boiled. When an ammoniacal solution of chloride of silver, with which sulphite of ammonia has been mixed, is kept boiling, all the silver is precipitated in the metallic state, under the form of a coarse powder, of a rather delicate white; this is a means of procuring silver in a state of extreme division. By boiling recent and moist chloride of silver in a solution of alkaline sulphite, it is decomposed, and is also very promptly converted into metallic silver. However, if the silver be required perfectly pure, it should be washed with ammonia.

The solutions of gold are immediately reduced, even without heat, by sulphurous acid and the sulphites; the liquor becomes bluish by transmitted light, and, by boiling it, the gold is precipitated under the form of a brown powder.

The deutochloride of platinum is decolored, with heat, by sulphurous acid, but slowly. It is, on the contrary, very quickly decomposed by the sulphites of potassa or ammonia, if its solution has been previously heated to the boiling point: when the sulphite is not in excess, the liquor remains liquid, although completely decolored; but, in the contrary case, a white granular precipitate is formed, which increases by cooling. This deposit, which is probably a double alkaline protochloride, is soluble in a large quantity of water, especially with heat. When the solutions of deutochloride of platinum are both cold, their mixture immediately gives rise to a yellow granular deposit of platino-alkaline deutochloride; but if this deposit be afterwards heated in a liquor containing some sulphite, it is dissolved and decolored, and the solution, if it is sufficiently concentrated, afterwards deposits, on cooling, the white granular substance above-mentioned.

The following are some processes of separation deduced from the above facts:—

Alumina and Glucina.—These two earths are found together in the emerald and in some other minerals, and it is often necessary to separate them to obtain pure glucina. If both have been dissolved in sulphuric acid, it may first be freed from the greater portion of the alumina by bringing the latter to the state of alum by the addition of a sufficient quantity of sulphate of ammonia to the concentrated solution; after which the liquor is decanted and diluted, an excess of sulphite of ammonia is added, and it is boiled until the disengagement of sulphurous acid ceases; the alumina is then entirely precipitated, and the glucinum remains alone in the solution, from which it is afterwards precipitated by ammonia. Or in place of this, the two earths may be precipitated by ammonia, and redissolved, while moist, in sulphurous acid, which dissolves both, and the solution must be boiled until the alumina is completely separated.

Alumina and Magnesia.—Magnesia may be separated from alumina in the same way as glucinum.

Yttria and Glucinum, Cerium and Glucinum.—Yttria and cerium may be separated from glucinum in the same way as aluminum. In proceeding thus, a considerable quantity of glucinum has been found in a sample of yttria preserved in the laboratory of the *Ecole des Mines*, as having been extracted from a gadolinite. It is now known that certain gadolinites contain glucinum.

Alumina or Yttria and Iron.—Sulphite of ammonia is added to the solution, or else the humid mixture of the hydrates is treated with sulphurous acid. By boiling, the liquor, which was at first of a brown-red color, however small the proportion of iron, is decolored, and afterwards allows all the alumina or yttria to deposit, and the iron alone remains in solution. But in filtering it some care is necessary, because the action of the air may determine the formation of an ochrey deposit which would soil the earth. The solution is boiled in a vessel with a narrow neck; then, when no more sulphurous acid is disengaged, this vessel is nearly filled with boiling water and corked; the liquor is poured on a filter when it is quite cold, it is replaced by boiling water, and the filtration and washing are thus finished. If the iron contained a certain quantity of phosphoric acid, this acid would be carried away by the earth. But it would not be the same with arsenic acid.

Alumina or Yttria and Manganese, Cobalt or Nickel.—Sulphite of ammonia is added to the solution and boiled; the earths are precipitated alone.

Zirconium or Titanic Acid and Iron, &c.—To purify a precipitate of zirconium or titanic acid which contains a small quantity of acid of iron, the direct action of sulphurous acid cannot be employed, because this acid dissolves only a very small portion of the precipitate, and does not separate the whole of the iron. The iron must first be brought to the state of protosulphuret in the ordinary manner, or the action of sulphite of ammonia must be employed, which is much more convenient. For this the precipitate is dissolved in muriatic acid, the solution is neutralised as exactly as possible by ammonia, sulphite of ammonia is added, it is boiled until no longer turbid, and is filtered with the proper precautions. All the iron remains in the liquor, which retains neither zirconium nor titanium.

Uranium and Iron, Manganese, Cobalt, Nickel or Zinc.—The uranium is separated from all these metals by boiling the solution after having added to it sulphite of ammonia. The iron might also be separated from it, but nothing else, by precipitating both metals by an alkaline carbonate, redissolving the precipitate in sulphurous acid and boiling: all the iron would remain in the liquor. If the uranium contained only very small quantities of manganese, cobalt, nickel or zinc, these metals would likewise be separated from it in the same manner, and would remain in solution.

Chrome and Iron.—To separate these two metals from each other, they are precipitated by ammonia or carbonate of ammonia, and the humid precipitate is treated by a slight excess of sulphurous acid; all the iron is dissolved, as well as a certain quantity of chrome, and the remainder of the latter metal is converted into pure subsulphite. The solution is boiled until decolored, and it then contains no more iron; in order afterwards to precipitate this metal from it, the sulphurous acid is driven off, either by means of sulphuric acid, or by means of nitro-muriatic acid, and an alkali or an alkaline carbonate is afterwards added to it; or else, without decomposing the sulphite, the iron is precipitated by an alkaline hydrosulphate. When a solution of chrome contains at the same time a sufficient quantity of alumina, all the oxide of chrome is carried away by this earth when it is precipitated by sulphite of ammonia. Hence we have a means of separating chrome from iron, manganese, &c. The metals being dissolved, any solution of alumina—alum, for example—is added to the liquor, then sulphite of ammonia is poured in, and it is boiled until it is no longer turbid; it is filtered, and if it still retains its green tint, alum and sulphite of ammonia, &c. are again added to it. The precipitate contains all the chrome and all the alumina, without any mixture of other oxides; by treating it with caustic potassa without heat, it is entirely dissolved; but the solution abandons the chrome at the boiling heat, and alumina alone remains.

Phosphate of Iron.—Dissolve in hydrochloric acid, add to the liquor sulphurous acid, sulphite of ammonia and a certain quantity of alum, and the alumina is precipitated taking with it all the phosphoric acid. If arsenic be present, it will entirely remain in solution.

Copper and Iron, Manganese, Cobalt, Nickel or Zinc.—By adding an excess of sulphite of ammonia to the solution of all these metals, and by boiling it, the copper is precipitated alone in the state of red subsulphite. This means might especially be employed in the analysis of brass; after the copper is separated, the zinc is precipitated by a hydrosulphate, &c.

Phosphate or Arseniate of Copper.—If these salts be dissolved in hydrochloric acid, and if the solution be boiled with sulphite of ammonia, the copper is precipitated in the state of red sulphite, and only a very small quantity remains in the liquor.

Phosphate and Arseniate of Lead might be analysed in the same manner after having been dissolved in nitric acid.

Tin and Iron.—Dissolve in hydrochloric acid, dilute with water, neutralise by ammonia, and add sulphite of ammonia. All the tin is precipitated, and the iron alone remains in the liquor.

Tin and Antimony.—Both metals being dissolved in concentrated hydrochloric acid, tartaric acid is added to the solution, it is diluted with water, sulphite of ammonia is poured in, and it is boiled; the tin is precipitated, and the antimony remains dissolved.

Gold and Copper.—Gold might be separated from copper by means of sulphurous acid. By boiling the liquor, the gold would collect in clots, sulphurous acid would be disengaged, and the salt of copper would remain intact, only rendered rather acid in consequence of the formation of a certain quantity of sulphuric acid.

Gold and Platinum.—The same means may be applied to the analysis of an alloy of gold and platinum.

ON A SIMPLE PROCESS FOR DETECTING THE PRESENCE OF NITROGEN IN MINUTE QUANTITIES OF ORGANIC MATTER.*

BY M. LASSAIGNE.

The presence of nitrogen in organic matters is in general indicated by various reactions which isolate this body in the gaseous state, by burning the combustible elements with which it is combined, or which convert it into ammonia (*nitroguret of hydrogen*), whose properties are then easily determined.

These means, which chemists employ daily, although sufficient when it is required to estimate the proportion of nitrogen in a ponderable quantity of organic matter, become almost unavailing and even impracticable, when we have at our disposal, only minute or almost imponderable quantities of the substance to be examined.

The process which we have put in practice, after having submitted it to numerous trials, is so sensible that it enables us to recognise the presence of nitrogen in quantities of nitrogenous matters so small as to be scarcely appreciable by the best balances. The chemical principle of this process, already known in science, has not yet, to our knowledge, been applied to the object here treated of. This means is based on the facility with which cyannret of potassium is formed when an excess of potassium is calcined at a dull red-heat, and out of contact with the air, with an organic matter containing even very little nitrogen. The product of this calcination, being dissolved in a few drops of cold distilled water, gives an alkaline liquor which, when mixed with a soluble subsalt of iron, occasions a greenish-blue or yellowish precipitate, which becomes a fine blue by the addition of a few drops of hydrochloric acid.

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* *Comptes Rendus*, No. 7, Feb. 13, 1843.

Quantities, inappreciable to a Fortins' balance, of urea, uric acid, allantoin, albumen, fibrin, dried gluten, morphia, narcotin and cinchonia, calcined in a small glass tube, after having been placed on a small piece of potassium, gave reactions always clear and well defined, which were in relation to the proportions of nitrogen which their organic substances naturally contained. Comparative experiments on principles deprived of nitrogen, such as pure sugar, starch, gum, salicin, did not furnish an analogous reaction. Finally, in operating with matters presenting in their complex composition the union of nitrogenous with non-nitrogenous principles, it was possible, even with minute quantities, amounting at the most to half a milligramme, unequivocally to establish the existence of nitrogen in these products. Thus, in a few minutes, nitrogen was detected in wheat, barley, and dried crumb of bread.

The minute quantities of matter on which this process is used, render it necessary to make the experiment in a small glass tube, 2½ centimetres in length and 1½ millimetre in diameter. At the bottom of this tube, closed at one of its extremities, is placed a small piece of potassium of the size of a grain of millet; it is gently pressed down with an end of platinum wire; the matter to be calcined is then projected on it. In some circumstances, where the matter is volatile, it is necessary to place it under the potassium, in order that the products of the decomposition by heat may react on this metal, and produce a certain quantity of cyanide. The above-mentioned arrangements being made, the tube is seized near its open extremity, with a pair of pincers, and gradually heated in the flame of a spirit-lamp, until the excess of potassium is volatilised through the carbonised organic matter. This point is easily recognised by the greenish vapor which shows itself at some distance from the heated part. After having heated to dull redness the part of the tube containing the mixture, the tube is withdrawn from the flame, and allowed to cool. To remove the product of calcination, the little tube is cut into two parts with a file; they are put into a small porcelain capsule, and four or five drops of distilled water are poured on them to dissolve the cyanuret formed. The liquor which results, decanted from the carbonaceons residue, or tested without decantation, with a drop of sulphate of iron, immediately produces a greenish precipitate, which, being put in contact with a drop of hydrochloric acid, becomes of a fine deep blue, if the matter tested contains nitrogen, even in small quantity. In the contrary case, the precipitate of hydrated oxide of iron, occasioned by the addition of the ferruginous salt, is entirely redissolved without producing any blue coloration.

The formation of cyanuret of potassium, caused, as is known, by calcining nitrogenous organic matters with potassa, might induce us to presume, that if in experiments similar to those above-mentioned, potassium be replaced by hydrate of potassa or carbonate of potassa, the same result might be arrived at: experiment, however, has proved the contrary, especially in the circumstances in which we operated. Thus, equal quantities of nitrogenous organic matter, separately calcined in small tubes at a dull red-heat, with caustic potassa and carbonate of potassa, did not give cyanuret of potassium; whilst the calcination, made at the same temperature, with potassium, always gave a well characterised reaction, unequivocally indicating the presence of this cyanuret.

The employment of potassium presents, therefore, an undoubted advantage in the different experiments, the object of which is to detect nitrogen in minute quantities of organic matter. We must, however, declare that such a result would be at least doubtful, if a non-nitrogenous organic matter were accidentally mixed with a small quantity of a nitrate or of an ammoniacal salt; in these two cases, the potassium, in acting also on these salts, might produce in the presence of the carbon of the non-nitrogenous organic matter, a little cyanuret of potassium, which would afterwards manifest the reaction of the salt of iron. The experiments which we made with starch, mixed with a little nitrate of potassa, or of an ammoniacal salt, have, indeed, shown us that, in this circumstance, there was, in the calcination with potassium, a formation of a very small quantity of the cyanuret of potassium.

Moreover, as the investigation of nitrogen as a constituent principle of an organic matter should generally be made only on purified matters, and consequently free from nitrates and ammoniacal salts, whose presence is so easily detected by known means, the method which we propose appears to us to be applicable to a great number of cases. This simple process should especially be employed when nothing more is required than the evident demonstration of the presence of nitrogen in the substance to be examined.

The applications of this method, so easily executed in a few minutes, will probably present themselves on more than one occasion; by employing it we have already been able to detect the presence of a nitrogenous matter in the excrement of a field mouse, which had been fed with *pure starch and pure sugar*. This observation, which at first sight would appear to disagree with the physiological and chemical phenomena, which have recently been admitted, would confirm what M. Leuret and I knew in 1825, *that the alimentary matter, in passing into the intestinal canal, is mixed with principles which are foreign to it, and that the excrementitious matter, voided after the act of digestion, is not exclusively formed of the residue of that function, but is more or less mixed with principles furnished by the different secretions of the digestive canal.*

The same means of investigation, applied to the study of various products resulting from the prolonged action of liquid ammonia on olive oil, enables us to recognise the formation of a nitrogenous matter, neutral and crystallisable, which we provisionally designate, on account of its mode of production, under the name of *elamin*. The first syllable of this word is borrowed from a Greek work, *ελαιον*, oil, and the second syllable from the three initials of the word ammonia. This action of ammonia on olive oil, which thus differs from that exerted by the other alkalis, appears to us in some measure to resemble the reaction remarked by MM. Dumas and Boullay, in treating certain ethers by ammonia. This observation would establish a new comparison between certain fatty bodies and several ethers of the third genus.

From the facts and observations detailed in this memoir, it results:—

1. That potassium heated to dull redness, with a nitrogenous organic matter, is easily partly converted into cyanuret, whose presence may then be detected by the salts of iron.

2. That this means, in the conditions in which it is employed, sufficiently delicate for detecting nitrogen in a small quantity of organic matter, cannot be replaced by substituting for potassium, either hydrate or carbonate of potassa.

3. That the application of this simple method to the detection of nitrogen in various products of organisation, will enable us to resolve a number of important questions in vegetable and animal physiology, without any necessity for submitting these products to too great a multiplicity of experiments.

INVESTIGATIONS CONCERNING THE ORGANIC ALKALIS.*

BY M. GERHARDT.

In examining the action of caustic alkalis on quinine, cinchonia and strychnia, the author of this Memoir discovered a new organic base, to which he has given the name of quinoleïn. The formula of this substance is $C^{76} H^{40} N^4$.†

It resembles nicotin and anilin in its liquid state, the absence of oxygen, and the singular property which it posseses of volatilising when distilled with water. The above mentioned organic alkalis give rise to quinoleïn, losing a portion of their hydrogen, which is set free, and the whole of their oxygen, which combines with the proportion of carbon which constitutes carbonic acid. This acid remains combined with the potassa used in the preparation of quinoleïn. The following formulæ account for the different products of these reactions:—

Quinine . . $= C^{80} H^{48} N^4 O^4 = 2C^2 O^2 + C^{76} H^{40} N^4 + 8H$,
Cinchonia . $= C^{80} H^{48} N^4 O^2 + 2H^2 O = 2C^2 O^2 + C^{76} H^{40} N^4 + 12H$,
Strychnia‡ . $= C^{88} H^{48} N^4 O^4 + 8H^2 O = 6C^2 O^2 + C^{76} H^{40} N^4 + 24H$,

Of these three organic bases, cinchonia is best adapted for the formation of quinoleïn. Strychnia does not succeed so well as the two others. This preparation is conducted as follows: a few fragments of caustic potassa are introduced into a tubulated retort, and melted; then, after having put in it a little powdered cinchonia, the heat is raised so that the alkaloïd turns brown, slightly swells up in consequence of a disengagement of hydrogen, and finally developes acrid vapors, which condense in the receiver with water. In proportion as they come over, the brown matter which floats over the potassa is seen to diminish; however, it does not completely disappear, for the production of the reaction is slightly altered by heat. It is as well not to employ too much cinchonia, but to add it by degrees.

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* *Annales de Chimie et de Physique*, February, 1843.

† $C = 37{\cdot}5$; $H = 6{\cdot}25$; $N = 87{\cdot}5$.

‡ Regnault has given strychnia a different formula from that which Gerhardt proposes.

A milky water is thus obtained, at the bottom of which a colorless or slightly yellow oil is found. Ammonia is not formed during the reaction; or, if any be formed, it is only accidentally and in small quantity. The milky water may be rectified, if the product found in it be too much colored, which only occurs in the employment of cinchonia.

Quinoleïn possesses a characteristic odor, which reminds us of that of St. Ignatius' bean, and which is so peculiar, that it furnishes a good means of ascertaining whether quinoleïn is developed in a reaction. Thus, for example, it is observed in the dry distillation of quinine; only it is then mixed with an ammoniacal odor, and the reaction is not clear.

It is heavier than water; it dissolves in it in small proportion and renders it milky, when it is added to it in great excess, boiled with water, it distils without alteration; but alone, it is easily decomposed by heat. The acids, even acetic acid and other vegetable acids, clear the solution, and completely dissolve the quinoleïn. The latter then changes its odor, and assumes, in saturating the acids, the odor of the juice of herbs. However, these salts, once crystallised and redissolved, do not present any odor.

Quinoleïn is extremely acrid and bitter; its salts possess as much bitterness; it is very soluble in alcohol, ether, and the essential oils. In a small dose it does not appear to possess poisonous properties; at least, one drop of this alkaloïd, placed in the mouth of a rabbit, did not appear to incommode it.

The aqueous solution of quinoleïn returns the blue color of reddened litmus paper, and presents the odor peculiar to this alkaloïd; it does not precipitate nitrateof iron, sulphate of copper, nor acetate of lead, probably because it is too weak to displace the bases of these salts; on the other hand it forms a white precipitate with nitrate of silver, as well as the bichlorides of mercury, gold and platinum. The hydrochloric solution of quinoleïn likewise produces precipitates in the solution of these chlorides.

Chromic acid gives a yellow and crystalline precipitate; the tincture of iodine and that of bromine color the milky solution of quinoleïn of a red brown.

This substance produces well defined and crystallisable salts; separated from its combinations by a mineral alkali, it reappears with its peculiar odor.

The sulphate forms fine white radiated crystals, very soluble in water and alcohol. The hydrochlorate crystallises in fine needles; and so does the nitrate.

The chloroplatinate of quinoleïn is deposited under the form of abundant yellow flocks, when a solution of bichloride of platinum is poured into hydrochlorate of quinoleïn. When the solutions are diluted with much water, the salt is obtained the next day in large, beautiful, acicular crystals. Of all the salts of quinoleïn, the chloro-platinate is most easily prepared and purified; dried at 100 degrees, its formula is

$$C^{76} H^{40} N^{4} + 2\,(H^{2} Cl^{2} Pt\ Cl^{4}).$$

It is from the analysis of this crystallised and very pure salt that the composition of quinoleïn was deduced—

$$(C^{76} H^{40} N^{4}).$$

Codeïn and piperin do not give rise to quinoleïn in their contact with caustic potassa. A new analysis of piperin, made by M. Gerhardt, confirms the composition attributed by M. Regnault to this substance. Its formula is,

$$C^{68} H^{38} N^{2} O^{6}.$$

As regards codeïn, it indicates different results: according to him, the composition of this organic alkali is—

$$C^{72}\ {}^{2}H^{42}\ N^{2}\ O^{6} + {}^{2}H^{2}\,O.$$

M. Regnault had found $C^{70} H^{40} N^{2} O^{5}$, for the formula of anhydrous codeïn deposited from an ethereal solution.

ON URINARY FERMENTATION.

BY M. JAQUEMART.

The urine from a healthy man, collected in very clean vessels, was slowly altered, even at a temperature of 32° C., and in stormy weather. It was slightly turbid a few hours after it was collected, and deposited a very light and very floculent substance, and then again became liquid. It was only at the ninth or tenth day that it commenced to cause effervescence with the acids, and allowed carbonic acid to be disengaged. The fourteenth day it gave nine times its volume of carbonic acid, which represents only 75 or 80 per cent. of what should be obtained in total.

To some of the urine arising from the same source, and obtained at the same moment, about 1 per cent. of beer yeast was added. From the fifth to the sixth day this urine, treated by acid, gave 6·7 times its volume of carbonic acid. The seventh day, it gave 12·6 times its volume of gas.

To another portion, 4 per cent. of beer yeast was added; from the fifth day, the acid produced a disengagement of gas of 10 times the volume of the urine. On the seventh day, 12·6 volumes of gas were obtained.

Urine to which 2·5 per cent. of glue had been added, gave, from the second day, 6·66 volumes of carbonic acid, and from the third day 10 volumes.

A few drops of a solution of carbonate of ammonia were added to fresh urine. This mixture, immediately tested, gave 2 volumes of carbonic acid; this acid arose from the carbonate added. At the fourth day, the urine gave 8·3 volumes of gas. Deducting the 2 volumes arising from the carbonate added, 6·3 volumes remain, produced by the urine. On the fifth day, the decomposition was complete. Another portion of this fresh urine, mixed with 8 per cent. of nearly decomposed urine, gave 6 volumes of gas on the second day; on the third, the decomposition was complete.

It had been remarked that the vessels arranged in public places for the reception of urine always give out a strong ammoniacal odor; one of these vessels was emptied and roughly washed, in such a way as not to remove the impurities attached to the sides of the vessel. Urine was collected after being allowed to remain 20 minutes in the vessel, and was filtered and mixed with fresh urine. The first day, the mixture was very turbid, and after 24 hours, gave six times its volume of carbonic acid; next day the fermentation was complete.

Even the urine of the vessel, unmixed, immediately filtered, was completely decomposed in the 24 hours.

The white deposit which is formed in the vessels, in which urine is habitually collected, and which is deposited during fermentation, appears to be the most energetic of all the agents of decomposition, as may be supposed from the preceding trial. This white deposit was collected on a filter, and dried on filtering paper. Two grammes were mixed with 100 grammes of fresh urine; these 2 grammes were in the state of paste.

After seven hours, the urine gave 3·5 volumes of carbonic acid; after 24 hours, the fermentation was complete.

To ascertain the degree of the decomposition of the urine, and to estimate the quantity of carbonic acid which it disengages, we operate in the following manner:—

In a graduated tube, filled with mercury and dipping in a mercurial bath, five divisions of urine are made to pass, then about five divisions of sulphuric acid a little diluted with water are introduced.

The tube is shaken to mix the liquors. The carbonic acid set free was measured by means of the divisions traced on the tube. At the moment of taking this measure, the mercury in the tube is put on a level with the mercury in the trough. The liquor arising from the mixture of urine and acid being sharply agitated in presence of carbonic acid gas, it has always been supposed that the liquid dissolved its own volume of carbonic acid. If this supposition were erroneous, it is sufficient, for all the volumes of gas obtained, to deduct twice the volume of the urine, as is seen in the following example:—

Urine . . .	5 divisions
Acid . . .	3 ,,
	8 ,,
Gas disengaged	27·5 ,,
Total gas . .	35·5 divisions, or

7·1 times the volume of the urine.

The eight divisions of the liquid are added to the volume of the gas, because it is admitted that this liquid has dissolved its volume of gas. If this supposition is incorrect, the urine in this example would give only 5·5 volumes.

A METHOD OF COMBATING CERTAIN DISEASES.

There being diseases in which the composition of the blood is affected, as, for instance, that in which a slight wound, otherwise of a trivial character, will occasion such a continued flow of blood as to be attended with fatal consequences; among the various remedies proposed for this evil, a very obvious one which occurred to me appears to have been neglected,—I mean that of injecting healthy blood procured from some animal into the sufferer, so as to supply the waste. The application of this principle may, perhaps, be very general; for instance, many considerable hæmorrhages might, perhaps, be overcome by this method. Again, would it not be possible to inject the vital fluid into a patient whose principal malady is loss of blood, as in the case of those who, by military operations, &c., have been well nigh drained of blood, before any assistance could be procured? And would not the bodies of those who have been emaciated by disease, be assisted in their restoration by the application of the same treatment, namely, the cautious introduction of blood?

These hints are put forward in a rude form, as I do not possess the means of verifying them experimentally; but I merely hope, for the cause of humanity, that those who have it in their power will give the subject a deliberate trial, unless from previous experiment its inutility be apparent.

R. P.

FORMATION OF THE DIAMOND.*

BY DR. ALEXANDER PETZHOLDT.

The author commences by stating that, notwithstanding the great diversity of opinion held by scientific writers, relative to the formation of the diamond, all the views entertained may be included in two principal divisions: 1st, those which regard it as an immediate product of the action of heat on carbon or carbonic acid; and 2nd, those which suppose it to be a result of the slow decomposition of vegetables. He then proceeds to give a brief *resumé* of the more important of these views.

While Leonhard † asks if we may not ascribe the origin of diamonds to the carbonaceous sublimation from the interior of the earth,—a question which, for chemical reasons, must be decidedly negatived, because carbon is not in the slightest degree volatile,—Parrot ‡ regards diamonds as products of volcanic action—the result of the action of heat on small portions of carbon. Parrot was first led to this view during his examination of Russian diamonds, in the course of which, he arrived at the conclusion that the only way of explaining some phenomena of structure, such as certain internal flaws, and a scaly appearance externally, together with black conglomerate enveloped portions of matter supposed to be carbon, was to consider that the carbon had been fused by a powerful heat, and that, owing to rapid cooling, the internal cracks and, in consequence of the separation of individual pieces from the external surface, the scaly structure, were produced. The black masses perceptible in the interior, are, therefore, imperfectly-fused, condensed, or crystallised carbon. Now, although it is undeniable that, with respect to the Russian diamond, the supposed mode of formation carries some probability with it, because geognostical investigations have proved the vicinity of dolomite, whose origin is generally considered to be connected with volcanic action, and have shown the probability of the diamonds having been removed by water, from their original matrix in that rock, to the place in which they are now found, not to take into consideration the fact that, according to his own investigations, no reasonable objection can be urged against the possibility of a fusion of vegetable carbon in certain cases; for all this, however, much may be advanced in opposition to Parrot's views. First, no signs of volcanic action are met with in the diamond districts of other countries, although identical cracks, flaws, and other structural peculiarities, occur in the diamonds produced by them; consequently, a different origin must be assigned to these diamonds. Secondly, no diamonds have been found imbedded in the dolomite of the valley of Adolphskoï. Thirdly, the existence of flaws and cracks in the interior, and of the scaly external structure, does not of necessity involve the assumption of powerful heat and rapid cooling, in the formation of diamonds; and the cracks, &c., may more naturally be ascribed to the blows sustained during the transport of a body so hard and brittle as the diamond, and the external exfoliation is entirely attributable to imperfect crystallisation, for the instances of it which Dr. Petzholdt has met with, have always been in the modified crystalline form,—to which belong all the specimens of Russian diamonds examined by Parrot, and never in those of the simple octohedral form.

Göbel's opinion relative to the origin of diamonds is, indeed, borne out by chemistry, since carbon may be produced from carbonic acid at a high temperature, by means of the reductive action of certain bodies, such as magnesium, calcium, aluminum, silicon, or iron, and a direct experiment of Dr. Petzholdt's, on the power of iron to reduce carbonic acid, is also favorable to it; but the geognostic relations in which diamonds are found, do not confirm this opinion; for we either meet with no phenomena relating to the occurrence of the diamond, indicating such a high temperature as would be required for the reduction of carbonic acid; or where such are presented, as in the case of the dolomite of Oural, diamonds have not been found in the rock. We have not taken into consideration the fact, that when carbon is isolated from its combinations, as, for instance, from carbonic acid, it always occurs under the form of a black powder.

Hausmann's opinion must not be left unnoticed. He considers, that electricity has operated in the formation of diamonds, and that the carbonic acid has been decomposed by lightning; and the argument used in favor of this is, that the oldest diamond seekers state that fulgurites, or lightning tubes, most frequently occur where diamonds most abound. Although we might assent to the possibility of such a decomposition, in certain circumstances, still we cannot regard the formation of the crystal from the carbon separated during the brief continuance of the action of lightning, as at all admissible. The formation of a crystal indubitably requires a much longer time than can be allowed during a flash of lightning, and no instance of a substance suddenly crystallising during the continuance of an electric spark is known.

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* From Petzholdt's *Beiträge zur Naturgeschichte des Diamantes*, 1842, and Prof. Jameson's *Edin. New Philosophical Journal*, April, 1843.

† *Populäriche Vorlesungen.*

‡ "Diamonds are produced by volcanic action exerted on small portions of carbon, or on a substance consisting of a large quantity of carbon, and very little hydrogen."

With respect to those opinions which consider the diamond to be of vegetable origin, it appears proper to place Newton's first; so far as my knowledge extends, it is the oldest and at the same time extremely acute. From its great refractive power, he regarded the diamond as a coagulated fatty or unctuous substance, and this opinion was given at a period when nothing relative to the chemical composition or combustible nature of the diamond was known. This was the first suggestion of its vegetable origin. Jameson was more positive as to the vegetable origin of the diamond: it was his opinion that it must be isolated in the form of pure carbon, from the sap of some plant, in the same way as silica in the form of tabasheer is deposited on the joints of the bamboo, &c. He advanced, as an additional proof of his opinion, the extraordinary hardness of certain woods, as the *Metrosideros vera*, &c., which he attributed to carbon approaching the state of the diamond.

Brewster adhered to the theory of the vegetable origin of the diamond, and thought that he might conclude, from its polarising properties, that at one period it must have been in a soft or pasty state, but not a product of fire. He further asserted that the former softness of the diamond must have approached nearest to that of hardened gum, and that, like amber, the diamond must have originated in the vegetable kingdom, and have resulted from decomposition. The crystalline structure of diamonds is not opposed to this view; for honey-stone is regularly crystallised, although it is undoubtedly of vegetable origin, which is proved not only by its chemical composition, but also by its mode of occurrence.

The author now arrives at his own idea of the formation of the diamond, which completely coincides with that of Newton, Jameson, and Brewster; but it is based neither on its strong refractive power, nor on the great hardness which the carbon has acquired in the diamond, nor on its properties of polarisation, for he is supported by entirely different considerations. We believe that, according to the present state of our knowledge, the diamond is a product of the newest geological period, arising from the slow decomposition of a vegetable substance. Let us now, as briefly as possible, adduce proofs of this opinion.

That the diamond must be a product of the youngest geological epoch, of the so-called historical epoch in a geological point of view, appears from the fact, that it has hitherto been found only in stoney deposits, which decidedly belong to the newest formations, as Dr. P. has more fully stated elsewhere. Its primary repositories, that is to say, the places in which it was formed, cannot differ much nor be very distant from its secondary repositories, namely, those places where it is now met with; and all the mineral substances which we are in the habit of regarding as the more or less constant associates of the diamond in diamond sands, are merely accidental. There is no reason for assuming that the formation of gold, platina, &c., is in any way connected with the diamond, for platina and gold are found in many places without diamonds. These bodies were either at the place at the time that the diamond was formed, or they were transported along with that substance by water. And although it cannot be denied in regard to some of the other ingredients of the diamond-sand, such as some of the minerals of the quartz genus, as quartz, chalcedony, and hornstone, and also brown ironstone, that they were formed at the same time (in a geological point of view) with the diamond; yet this circumstance by no means supports the idea of any sort of connection between their formation and that of the diamond, because the recent formation of these bodies may be observed every where, and where diamonds do not occur. The association of all these substances, to which the term accidental has been applied, is caused merely by the geognostical constitution of the district through which the river-course of the present day extends, by the nature of that course itself, by specific gravity, and by many other circumstances not in the slightest degree connected with the formation of the diamond. The strongest proof, however, of the recent origin of the diamond, is its occurrence in the loose rolled matter in which and with which it was formed, combined with the want of success which has hitherto attended the search for the diamond imbedded in those rocks, regarding which it is so easy, on the other hand, to prove that from them all the other rolled bodies had their origin. We entirely leave aside the question, as to the correctness or incorrectness of the belief popularly prevalent in the East Indies and Brazil, that diamonds are still produced.

Moreover the diamond must have been formed in the humid way from a liquid, because otherwise it would have presented none of the enveloped splinters of quartz of which the author has spoken in another place,* and of which some even exhibit the vegetable cellular texture.

To the best of our knowledge, the material from which the diamond was formed, by the separation of crystallised carbon, could only have been a substance rich in carbon and hydrogen—such as, owing to the necessary chemical properties, can be met with only in the vegetable kingdom ; and we are forced to regard the diamond as a product of this substance, consisting of carbon and hydrogen, by means of decomposition. The determination of the nature of this process is solely a chemical matter ; and Liebig, who has rendered the greatest service to our knowledge of the decomposition of organic substances, makes the following remarks :—"If we suppose decay to proceed in a liquid, which contains both carbon and hydrogen, then a compound containing still more carbon must be found, in a manner similar to the production of the crystalline colorless naphthalin, from a gaseous compound of carbon and hydrogen. And if the compound thus formed were itself to undergo further decay, the final result must be the separation of carbon in a crystalline form. Science can point to no process capable of accounting for the origin and formation of diamonds, except the process of decay. Diamonds cannot be produced by the action of fire ; for a high temperature, and the presence of oxygen gas, would call into play their combustibility. But there is the greatest reason to believe that they are formed in the humid way, that is, in a liquid ; and the process of decay is the only cause to which their formation can with probability be ascribed."

As yet we are unacquainted with the nature of the vegetable substance, rich in carburetted hydrogen, by whose decomposition the diamond is formed, and of what is the especial conditions requisite for the appearance of crystallised carbon. This alone do we know, however,—that the whole process is one of extreme slowness, and that it cannot in any way be hastened by an increased temperature, for in that case the carbon cannot be crystallised, but must, on the contrary, be separated in the form of a black powder.

The conclusion at which Newton arrived from certain optical properties of the diamond, viz., that it was produced from an oily body, is very beautifully confirmed by the newest and most accurate investigations of chemistry ; for, according to them, the so-called oily bodies are proved to be the richest in carburetted hydrogen ; and chemistry, which alone can explain the decompositions of bodies, and their production from elements, just requires for the formation of the diamond, the decomposition of a substance abounding in carbon and hydrogen. There are two phenomena connected with the above explanation of the origin of the diamond, which must not be left unnoticed, as they are eminently calculated to place the correctness of our assertions in a clearer point of view. As Dr. P. has already stated elsewhere, diamonds not unfrequently exhibit at their surface blackish spots, which disappear on heat being applied ; and, moreover, they very frequently present in their interior perfectly black, amorphous bodies, which can be regarded as nothing more than uncrystallised carbon,—a fact observed in the course of Parrot's investigations,* as well as my own. This phenomenon can be explained only by supposing a somewhat accelerated decay of the matter containing carbon and hydrogen ; in the course of which the carbon has been obtained in the form of a black powder, instead of being separated in the crystallised state. On the other hand, I have on several occasions had an opportunity of convincing myself of the tendency of carbon to crystallise, when the combustion (the rapid decay†) of a substance containing much carbon and hydrogen is retarded. Thus, on the wicks of badly burning tallow candles, he had seen the well-known accumulations of carbonaceous matter (soot), which are generally of a globular or semi-globular form, assume distinctly an octohedral shape ; and he believes that this appearance has long been observed by others, for it is only by the similarity of an octohedron to the envelope of a letter that he can explain the popular saying, of there being "a letter" in the wick of a candle. He even preserved, for some time, one of these tolerably well defined octohedrons, and exhibited it to his class ; but it was at last broken, and it then appeared that the fragments were harder than ordinary soot, although they could still be easily bruised between the fingers.

Let me add a few words regarding the experiments made in recent times on the production of artificial diamonds, for I believe that I may say, without exaggeration, that, since it was discovered that the diamond consists of pure carbon, there is hardly any chemist who has not performed more or less extensive experiments on the subject. That the results of such investigations have been published by but few chemists, is no proof that few experiments have been made; for human nature and vanity prefer silence to publicity, where investigations have failed and hopes have been disappointed.

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* *Vide Jameson's Edin. New Phil. Journal*, for January, 1843, p. 187.

* *See Parrot, Notice sur les Diamans*, pp. 3 and 31.

† That combustion is only a rapid decay, and decay only a slow combustion, is known to all chemists. Above all, see Liebig's remarks on this subject in the second part of his *Organic Chemistry*.

All the experiments with the object of forming factitious diamonds may be referred to two methods, viz., the attempt to fuse carbon, and the endeavour to separate carbon in a crystalline state from a highly carbonaceous compound, by means of decomposition. It scarcely needs to be mentioned that all the trials have hitherto been in vain. The experiments made with the first view have been rendered unsuccessful by the infusibility of carbon; and the others, proceeding on the second idea, have always resulted in the production of carbon in the form of a black substance. If any one should be of opinion that, by the assistance of a constantly operating electrical stream, highly carbonaceous bodies might be separated in a crystalline condition, that is, in the form of diamonds, just as copper and other metals have been recently obtained, in the crystalline state, from solutions, by Jacobi's method, such an expectation will prove to be a vain one: for, on the one hand, the substances best adapted for galvanic decomposition are non-conductors of electricity, as, for example, sulphuret of carbon, oil of turpentine, copaiba balsam, &c.; and, on the other hand, if we should succeed in separating, from any compound, crystalline carbon on the conducting wire, yet, according to theory, at the very moment when even the most delicate covering of crystalline carbon should be deposited, all further action on the decomposing liquid would be intercepted, for the matter of the diamond itself is known to be a non-conductor of electricity.

ON THE ATTRACTION OF COHESION.

BY REUBEN PHILLIPS.

This force has been defined as a power which exerts its influence only on molecules situated at an inappreciable distance from each other. This force is that which is considered to constitute the solid form of matter, and when counterbalanced to a certain extent by the primary or secondary influence of heat, the liquid state is conferred; it is to the attraction as exhibited in this state that I wish particularly to direct attention.

If a small quantity of water be somewhat isolated from other attractions, the attraction of cohesion will confer on the mass a more or less spherical form, as may be seen by dropping water on a heated metallic plate; and it is beautifully illustrated by falling drops of rain, the regularity of their forms giving rise to the phenomena of the rainbow.

From a consideration of these and similar facts, it is obvious that the attraction of cohesion exerts its influence at very considerable distances; for if the attraction of cohesion be exerted only between bodies in contact, then must the whole of the attraction be expended in binding the attracting atoms together, and as the acting atoms are in contact, and as the attraction at any point of the atom is equal to what it is at any other point, therefore the attractive force must be the same with any relative position of the attracting atoms; from which it may be inferred that any number of these attracting atoms may be arranged in any form without a tendency to assume any other figure.

But if we consider the attraction to be exerted between atoms at a distance, then must they be indifferent to any relative position beyond this point; for, to demonstrate this, let any number of atoms be disposed in any figure, the atoms acting on each other only when at such a distance as to be touched by, or included in, a sphere of a radius of one and a half diameter, taken from the centre of each atom, it is evident, without entering deeply into the subject and determining the exact forces exerted on the different atoms, that when the thickness of the mass is five atoms or more, the forces are all in equilibrium; and the same may be said if the attraction be extended to any number of atoms, provided the thickness of the solid figure be equal to the diameter of the sphere limiting the attraction; but if the thickness of the mass at any point be less than this, the equilibrium can only be maintained by some additional force tending to preserve this form.

If the attraction extend to any limited number of atoms, and if the number of atoms composing the mass be considered as infinite, such a mass must be passive as to form, with the limitation before mentioned; from this it is, I think, clear, that the spherical form can only be produced when its radius is not greater than the distance to which the attraction operates.

I have considered atoms as virtually spherical and not polar, both as being the most simple supposition, and as well answering to the known properties of fluids; however, the views may perhaps be applied to any fluid system of atoms.

This attraction differs from the attraction of gravitation in this essential particular, namely, that whereas the attraction of gravitation operates through any intervening body, the attraction of aggregation is cut off, apparently completely, by the thinnest film of foreign matter: this may be illustrated by agitating a little mercury with water in a shallow vessel, by which means it can be easily reduced to a number of shining globules, seemingly in contact, but yet not in the least affecting each other's figure in the way they do after the contact is completed.

The attraction of cohesion must be very strong in lead, as is seen in the process of shot-making, and also by bringing two bright pieces of lead in contact, when they cohere; now if this attraction acts on masses through foreign matter, then, in the late repetition of the Cavendish experiment, its effects ought to have been manifested; this appears to be decisive as to its not being propagated through any but homogeneous atoms. Again, if mercury be amalgamated with a little zinc, its tendency to assume the spherical form is much diminished, which seems to show that the force is incapable of acting through the alloyed particles dispersed through the mass.

THE COMPOSITION AND PRODUCTS OF DISTILLATION OF SPERMACETI, WITH SOME FEW REMARKS ON ITS OXIDATION BY NITRIC ACID.*

BY LAWRENCE SMITH, M.D., OF CHARLESTON, S. C.

(*Continued from p.* 165.)

EXAMINATION FOR OLEÏC ACID IN SPERMACETI.

A PORTION of the acid was digested with water and the protoxide of lead, at a temperature of 212° Fah., and in the course of a short time a lead salt was formed, which, after being perfectly dried, was treated with cold ether; that dissolved no portion of the salt—a circumstance that could not have occurred, had the oleate of lead been present, as this salt is soluble in ether, and it is one of the means used to separate oleïc acid from other fatty acids.

The above is the most direct way that we have of deciding upon the presence of oleïc acid, and the indication which it affords in the present case, was of too positive a character to admit for a moment the existence of this acid in the substance examined. But this single evidence, although sufficient of itself, has other indirect proofs to support it.

Redtenbacher,† in his examination of the products of the distillation of oleïc acid, observed the fact, that if this acid, or any substance containing it, be distilled, sebacic acid is invariably formed. To this test spermaceti has been subjected by both Redtenbacher and myself, with similar results, that is to say, that in the products afforded by the distillation of spermaceti, no trace of sebacic acid is to be found.

The product furnished by the oxidation of spermaceti by nitric acid, is another proof of the non-existence of oleïc acid in this substance. Laurent, and subsequently Bromeis, have shown that, when oleïc acid is oxidised by nitric acid, suberic acid is one of the most abundant products of this decomposition. Now, if spermaceti be oxidised by nitric acid, no trace of suberic acid is furnished.

Having, then, the support of both direct and indirect evidence, I do not hesitate to affirm that *spermaceti contains no oleïc acid.*

A question necessarily arising from this fact was, what was the acid that Chevreul had taken for oleïc acid? To decide this, the following steps were taken. That portion of the acid obtained from the lime salt, which had not been digested with the oxide of lead, was treated with carbonate of soda, this forming a soda salt, which being dissolved in hot water, was decomposed by tartaric acid. The fat acid, thus liberated from the soda, was dissolved in warm alcohol, and upon allowing the solution to cool, a considerable quantity of the acid crystallised out. The alcohol was poured off this crystalline deposit, and concentrated by evaporation, from which another portion of the acid was allowed to crystallise. The alcohol was decanted a second time, concentrated, and allowed to cool; and by repeating this four or five times, and at last evaporating all the alcohol, there was left a small quantity of a solid fatty mass, which evidently still contained a considerable portion of the same acid that had been crystallised from the alcoholic solution. The acid had a melting point of 68° Fah., and consisted of a mixture of a fluid and solid acid, but it was impossible to obtain the former in a state of purity, and as, consequently, no accurate examination of it could be made, none was undertaken.

The fluid acid that composed a portion of this mass, was in too inconsiderable a quantity to be considered an essential constituent of spermaceti, particularly, too, as its presence can be plausibly accounted for. Spermaceti, as it exists in nature, is mixed with an oil, from which it is separated by pressure for domestic use; now it is impossible that by simple pressure we should be able to deprive the spermaceti completely of this oil; but in Chevreul's analysis, as well as in mine, the spermaceti of commerce was treated with hot alcohol, ·820; still there are many reasons for supposing that even by this means it is impossible to extract all the oil; either from the fact that the oil is not more soluble in alcohol than the spermaceti, or that the attraction that the oil and spermaceti have for one another is too strong to be overcome by this means. Of the truth of this latter supposition we have many similar examples, particularly among the fats,—a circumstance which renders their examination to the present day incomplete and imperfect. At some future time my attention will be directed to the examination of spermaceti prepared in a different manner from that pursued in the present case, particularly with the object of ascertaining whether spermaceti cannot be so purified as that its saponification will give rise to no fluid acid.

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* *American Journal of Science and Arts.*

† Redtenbacher, properly speaking, was the first to generalise this fact, for it has been a long while since it was observed.

Thus, then, as regards the existence of a fluid acid in spermaceti, all that can be said is, that from the small quantity found, and from other reasons just stated, there are strong reasons for believing that it contains none, and that what has been found is due to an impurity, which is not removed by alcohol of ·820.

SOLID ACID RESULTING FROM THE SAPONIFICATION OF SPERMACETI.

I now come to the second part of the examination, and by far the most interesting; that of the solid acid obtained from the saponification of spermaceti, for it is this and athal that are the essential products resulting from the action of potassa upon spermaceti.

The solid acid obtained in that part of the examination, which was directed to ascertaining the presence of a fluid acid in spermaceti, and which was crystallised out of alcohol, was found to be nearly in a state of purity. This was dissolved in a mixture of equal parts of alcohol and ether, and allowed to crystallise out. This operation was repeated two or three times, and the crystalline deposit was then thrown upon a filter, and washed with cold alcohol of ·820. The acid thus obtained was pure, and possessed the following properties.

It melted at 130° F., and upon cooling crystallised in small needles, diverging from a number of centres, and when cool was white; it resembled somewhat in appearance wax, it being slightly translucent. It was dissolved in all proportions by alcohol of ·820 at 140° F., and upon cooling crystallised out in small needles, which collected together in the form of moss, and sometimes in that of cauliflower; from this, the alcohol can be poured so as to leave it almost perfectly dry. Out of ether this acid crystallised with difficulty, owing to its excessive solubility in this menstruum. When heated to a high degree it volatilises without leaving a residue. The alcoholic solution reddens litmus.

The physical properties of this acid will be seen to differ from those of margaric acid, which it has been supposed to be, but there is no striking difference between these two bodies in composition, as will be seen in the results afforded by the analysis of this body.

Exp. 1. 0·2815 grammes of the acid burnt with the binoxide of copper, gave* 0·7725 gram. carbonic acid and 0·320 gram. water.

Exp. 2. 0·2325 gram. of the acid burnt with the binoxide of copper, gave 0·637 gram. carbonic acid, and 0·261 gram. water.

Exp. 3. 0·328 gram. of the acid burnt with the chromate of lead, gave 0·890 gram. carbonic acid, and 0·3685 gram. water.

These three analyses furnish the following proportions of carbon, hydrogen and oxygen, in 100 parts of the acid.

Carbon	75·44	75·31	74·64	75·13†
Hydrogen . . .	12·60	12·47	12·46	12·51
Oxygen	12·96	12·22	12·90	12·36
	100·00	100·00	100·00	100·00

Having thus found the relative proportions of the elements contained in this acid, it was necessary to examine one of its salts, to ascertain its atomic composition, and for this purpose, as in most cases, its combination with the oxide of silver was chosen; but to form this salt it was necessary first to form its soda salt.

Soda Salt.—A portion of the acid was digested with a solution of carbonate of soda, until a complete combination had taken place, which is easily known by the acid no longer floating on its surface, it having

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* All my calculations are made with the atomic weight of carbon given by Liebig and Redtenbacher, (75·85 oxygen being considered 100, or 6·068 hydrogen being taken as unity.

† Composition of margaric acid after the analysis of Varrentrapp.

Carbon . . .	75·35
Hydrogen . . .	12·33
Oxygen . . .	12·36
	100·00

all united with the soda, forming a salt soluble in water. The solution of this salt, which contained an excess of carbonate of soda, was evaporated to dryness in a water-bath, and the dry mass, pulverised, was treated with absolute alcohol, which dissolved the soda salt and not the carbonate of soda; from this the alcoholic solution was separated by filtration, and this last, evaporated to dryness, furnished the salt perfectly pure.

Silver Salt.—This salt was formed by a double decomposition of the salt just described, and nitrate of silver. The soda was dissolved in water, and to this was added a solution of nitrate of silver, which produced a white flocculent precipitate, the salt in question. This precipitate was thrown on a filter and well washed with warm distilled water, and dried at 212° in the dark.

This silver salt, when burnt in a porcelain crucible, gave the following results:—

Exp. 1.	0·332 gram.	silver salt	gave	0·098 gram.	silver.
,, 2.	0·389 ,,	,,	,,	0·117 ,,	,,
,, 3.	0·5765 ,,	,,	,,	0·1705 ,,	,,

Out of these the following per centage of silver and oxide of silver in the salt was calculated:—

Exp. 1.	29·56	silver,	31·75	oxide of silver.
,, 2.	29·39	,,	31·57	,, ,,
,, 3.	29·59	,,	31·77	,, ,,

From the same analysis the atomic weight of the anhydrous acid was calculated to be, from—

Exp. 1.	250·00	Mean, ... 250·24
,, 2.	251·52	
,, 3.	249·36	

The silver salt was now analysed with binoxide of copper, to ascertain the quantity of carbon and hydrogen that it contained.

1. 0·4735 gram. silver salt burnt with the binoxide of copper, gave 0·910 gram. carbonic acid, and 6·3595 gram. water.

2. 0·483 gram. silver salt burnt with the binoxide of copper, gave 0·034 gram. carbonic acid, and 0·3705 gram. water.

From these analyses we find in 100 parts of the salt:—

	I.	II.	Mean.
Carbon . .	52·84	53·15	53·00
Hydrogen . .	8·42	8·52	8·47
Oxygen . .	7·04	6·63	6·83
Oxide of silver .	31·70	31·70	31·70
	100·00	100·00	100·00

Out of this the following formula is calculated:—

Atoms.	Atomic Weight.	In 100 Parts. Calculated.	In 100 Parts. Found.
32 Carbon . .	194·18	53·16	53·00
31 Hydrogen .	31·00	8·48	8·47
3 Oxygen . .	24·00	6·57	6·83
1 Oxide of silver	116·13	31·79	31·70
	365·31	100·00	100·00 *

The anhydrous acid is constituted as follows:—

Atoms.	Atomic Weight.	In 100 Parts.
32 Carbon	194·18	77·92
31 Hydrogen . . .	31·00	12·44
3 Oxygen	24·00	9·64
	249·18	100·00

	Atoms.		In 100 Parts.
* Margarate of silver	34 Carbon . .	206·31	54·57
	33 Hydrogen .	33·00	8·65
	3 Oxygen . .	24·00	6·30
	1 Oxide of silver.	116·13	30·48
		379·44	100·00

The atomic weight of this acid, found by burning the silver salt, was 250·24. The acid not in combination with a base, contains one atom of water, and has for its composition :—

Atoms.	Atomic Weight.	In 100 Parts.	
		Calculated.	Found.
32 Carbon .	. 194·18	75·21	75·13
32 Hydrogen	. 32·00	12·39	12·51
4 Oxygen .	. 32·00	12·40	12·36
	258·18	100·00	100·00

After the results afforded by these analyses, it is impossible to confound this acid with margaric acid, and particularly too, as its composition agrees with that of another acid described by Dumas and Stass, under the name of *athalic acid*, and which they obtained by acting upon *athal with potassa*, at a temperature of from 390° to 410° Fah. The acid, then, which has just been described, and which was obtained from the saponification of spermaceti, is *athalic acid*.

The athal that Chevreul mentions as being the base of spermaceti, and related to it, as glycerine is to the other fats, was found to be of the same nature that he describes it to be.

(*To be continued.*)

CHLORIDE OF PALLADIUM AS A TEST FOR IODINE.*

Baumann has made some experiments on the comparative sensitiveness of an acid solution of the chloride of palladium and of the usual solution of nitrate of silver, and has found that one drop of the former produces a more voluminous precipitate than several drops of the latter in a solution of the iodide of potassium; and, further, that when the solution is diluted 50,000 times, nitrate of silver still causes a white turbidness, and chloride of palladium, after a few minutes, black flakes; the dark color of the precipitate with chloride of palladium renders it more easily perceptible. When diluted 500,000 times, neither of the solutions afforded any reaction.

CHEMICAL NOTICES.—ACCIDENT TO BERZELIUS.†

EXTRACT OF A LETTER FROM BERZELIUS TO M. PLANTAMOUR.

I am occupied with solving some questions for the new edition of my *Elements of Chemistry*. One of these relates to the difference between fluoboric and hydrofluoboric acid. I have found that concentrated fluoboric acid is a compound of hydrofluoric acid with hydrated boracic acid. The formula of the most concentrated acid, of the density of 1·77, is $H^2 O, B O^3 + 3H^2 Fl^2$. That which passes over by distillation after a considerable quantity of fluoride of boron has escaped, has the density of 1·58, and is composed of $2H^2 O, B O^3 + 3H^2 Fl^2$. What proves in an evident manner that these liquids are not simple solutions of fluoride of boron in water, is that when aqueous solutions of borates and fluorides are mixed together, the latter combine to form double salts in which boracic acid and fluorine are in the same proportion as in the liquid acids. In this manner, I have obtained three double salts, which crystallise in determinate forms, namely: $So O, B O^3 + 3So Fl^2 + 8H^2 O$; $So O, 2B O^3 + 6So Fl^2 + 22H^2 O$; and $2H^2 O, B O^3 + 3So Fl^2$. The two first are isomorphous; these are right rectangular prisms terminated by an oblique face, and the last is a rhomboïdal dodecahedron.

I have likewise examined the *sulphurets of phosphorus*. Phosphorus combines with sulphur in three proportions which may exist in the isolated state, namely: $P^4 S$, liquid at the ordinary temperature, transparent and colorless; $P^2 S$, liquid, transparent and yellow; and $P^2 S^{12}$, which are the crystals that M. Duprez represented by $P^2 S^6$. We cannot produce isolated combinations of the form $P^2 S^3$ or $P^2 S^5$; for when $P^2 S$ is fused with the smallest excess of sulphur, we obtain by cooling, crystals of $P^2 S^{12}$. Nothing is easier than to obtain these combinations in small tubes closed at one extremity; the phosphorus is first weighed and then the sulphur is added in pieces, after which the tube is closed by means of a cork, and it is exposed to a temperature of 40° C., at which fusion is slowly and tranquilly operated. If, on the contrary, pulverised sulphur be taken, the mixture explodes. I once operated the fusion of these two bodies *in vacuo*, heating the mixture with a lamp; it was then accompanied with a vivid light and an explosion. If they be heated together under water to 40° C., they fuse gently.

When metallic sulphurets in fine powder

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* *Lond. and Edin. Journ. of Med. Science*, April, 1843.

† *Bibliothèque Universelle*, No. 85, Jan. 1843.

are heated together with sulphuret of phosphorus, and when the latter is separated by distillation, a combination of the sulphobase with $P^2 S^3$ is obtained, whose composition is represented by $2R\,S + P^2 S^3$. This combination, heated to redness, is reduced to $2R\,S + P^2 S$. I have not yet succeeded in producing a combination with $P^2 S^5$, but I have not yet given up all hope of success.

I also endeavored to produce sulphophosphate of soda in the dry way. With this view I introduced into a small retort 6 grammes of calcined carbonate of soda, and 8 grammes of sulphur, both well pulverised and intimately mixed; I afterwards added 10 grammes of $P^2 S$, stirring so as to form a pap, and I heated the retort in a sand-bath over a spirit lamp, with as small a flame as possible. Suddenly, a frightful explosion took place, which left no trace of the retort, and which very much injured the left side of my face, and set fire to my hair. I am happy in having escaped with so little injury. In order to account for the cause of the explosion, I heated, in a small tube, carbonate of soda with $P^2 S$. The combination was effected without explosion, with a disengagement of carbonic acid and vapors of phosphorus, and there remained a deep red mass, which became deep brown, when further heated, but without undergoing fusion. This mass treated by water yielded liver of sulphur, leaving an insoluble black residue, formed of charcoal and perhaps metaphosphate of soda (?) which, when the charcoal had been removed by calcination, was reduced into a vitreous mass. Since the reduction was not accompanied by an explosion when free sulphur was not employed, intimately mixed with the alkali, it is probable that the explosion was due to the sudden combination of $P^2 S$ with a greater quantity of sulphur, which instantly decomposed the carbonate of soda.

An experiment which I made with the view of making myself acquainted with hydromellonic acid, led me to the discovery of a new acid, probably mellonic acid. By dissolving mellon at a gentle heat in caustic potassa, I obtained, besides the hydracid, an oxacid which difficultly crystallises, which has a very decided bitter taste, and whose study I have confided to a friend in order to be in time to give the details in the new edition of my *Elements of Chemistry*.

We meet with, in commerce, under the name of *pereirine*, a salifiable vegetable base which has not been mentioned in my annual reports. I procured a small quantity of it, and I found that it is a salifiable vegetable base. The vegetable which furnishes it is not known, but we simply know that it is extracted from the *cortex pereiræ*.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

NEW METHOD OF PREPARING FUEL.*

BY DOMINIC FRICK ALBERT, LL.D.

THE materials used in the preparation of the fuel, are bituminous schist, which is a slate or dark colored stone, partaking of the nature of both coal and charcoal; aluminous clay,—a refuse, or the bottoms of the acetate of alumine, in red-liquor works; ground coal,—a refuse from coal-pits, which should be quite free from sulphur; vegetable gelatine or tar,—a refuse from pyroligneous acid works, or wood distilleries; mineral gelatine or tar,—a refuse from coal-tar distillation; and mineral oil,—a refuse from naphtha distillation.

In manufacturing fuels from these materials, the patentee proceeds as follows:—Five parts of the vegetable gelatine, and the like quantity of mineral gelatine, are heated in a pan, until they are brought to a proper consistence; and then ten parts of schist, ground to a powder; ten parts of ground coal, and five parts of aluminous clay, well dried, and mixed with four per cent. of mineral oil, are added to the gelatine. The ingredients are worked into a paste, which is deposited in a hole in the ground, near the pan, and, when cold, forms a cake or flag, without the employment of a press or mould.

The aluminous clay may be omitted, if it cannot be conveniently procured; but then the mineral oil must be mixed with the finest part of the schist, separated from the rest by a riddle; or, as a substitute for aluminous clay, fat marl or common clay, free from stones, may be employed.

When the artificial fuel is to be manufactured in places where there are no wood distilleries, the vegetable gelatine may be left out; but, in that case, ten parts of mineral gelatine must be used instead of five.

The patentee claims the new combination of the materials and processes, above described, for the manufacture of fuel.

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* *Lond. Journ. and Repertory of Arts, &c.* April, 1843.

ACTION OF AMMONIACAL SALTS ON VEGETATION.*

BY M. A. BOUCHARDAT.

HAVING been occupied for the last ten years with investigations relative to the influence exerted on vegetation by substances absorbed by the roots, I now submit to the Academy some results which appear to me calculated to throw light on the theory of manures.

The efficacy of ammoniacal salts in manures is now generally admitted by the chemists who have turned their attention to agriculture. Practical facts on the one hand, and very powerful general considerations on the other, give to this theory such value, that it may almost be asked if it requires the sanction of direct experiments.

However, I thought I ought to make these experiments, and, as they have led me to a different conclusion, I deemed it necessary, before giving publicity to them, to repeat them several times, and in circumstances which would shield me from causes of error, so difficult to avoid in investigations of this kind. It will be seen, by the details into which I am about to enter, that I have neglected nothing which could render my experiments conclusive.

The ammoniacal salts which I have tried are—the sesquicarbonate, the bicarbonate, the sulphate, the hydrochlorate, and the nitrate. These are the salts which may be presented, in the natural course of things, to the roots of plants.

Some branches of *Mimosa pudica* were placed in flasks with perforated corks, and filled with filtered Seine water (each branch in a separate vessel): these branches were submitted to experiment only when they were provided with adventitious roots; those only were used which were vigorous, and whose foliage was at once very green and very sensitive.

On the other hand, I made in distilled water solutions containing $\frac{1}{1000}$th of the above-mentioned ammoniacal salts: these solutions were substituted for the Seine water; several plants were kept in pure water, as a means of comparison.

After twenty-four hours the plants still vegetated well, but the leaves had lost much of their sensitiveness. After forty-eight hours, the plants vegetating in the flasks containing the solutions of carbonate of ammonia, were deprived of all motive power; the inferior leaves had drooped; next day, the plant was dead. The mimosa, vegetating in the solution of nitrate of ammonia, held out one day longer; that which was in a solution of hydrochlorate, two days longer. But after six days, all the plants had perished. I reduced the solution of ammoniacal salts to $\frac{1}{1500}$th, and analogous results were observed.

It might be objected to these experiments, that the branches of mimosa provided with adventitious developed roots, very slowly absorbed the solutions, and in general vegetate in water with very little energy, that, sooner or later, they perish; but I operated comparatively, on branches which had remained in water, and which held out very well. However, wishing to oppose conclusive results to these objections, I selected, as subjects of experiments, plants which do not perish in pure water, even when they are kept in it for a whole year, and which may fulfil in it all the phases of their vegetation, and develope in it fecund seeds. None are better suited for these experiments than the *Mentha aquatica* and *sylvestris.* The *Polygonum orientale* is also well adapted for these experiments, because it developes numerous roots, and accomplishes in water all the phases of vegetation, and quickly absorbs a great quantity of liquid, and because we can experiment at the period of the development of the seeds, a time at which the nitrogenous aliments are, it is said, most indispensable to vegetables.

Very healthy branches of these plants were placed in flasks filled with filtered water. As soon as they were provided with abundant adventitious roots, and as soon as the absorption of the liquids was very active, I replaced the water with ammoniacal solutions at $\frac{1}{1000}$. The results were again perfectly similar, only the plants perished much more quickly, because the absorption was likewise more rapid. I reduced the proportion of the ammoniacal salts to $\frac{1}{1500}$, and the poisonous action was also very rapid. The plants selected were those which vegetate very well in water. The deleterious influence of ammoniacal salts, is, therefore, perfectly established: but again it may be said, the best aliments, when taken in excess, may likewise occasion death: to that I reply, that a solution at $\frac{1}{1500}$, is already very dilute, but we have diluted it more, and we have remarked that the poisonous results become less marked, but the fatal influence of ammoniacal salts was still evident at $\frac{1}{3000}$; when more diluted, they do not produce any appreciable useful or injurious effect. It is not in water, but in the earth, that the roots of plants exercise their functions, and the circumstances being different, the results also may differ. I also had recourse to experiment to reply to this objection.

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* *Comptes Rendus*, No. 6, February 6, 1843.

I selected a plant which does not vegetate in water, but which grows quickly and well in the earth, and which is supposed to require much nitrogenous aliment—the cultivated cabbage (*Brassica oleracea*).

I selected several cabbages of equal weight, and of nearly similar strength; I planted them in a mixture of equal parts of mould and good garden earth; each of these cabbages was placed in a box of the same size, with the same weight of earth. I sprinkled them with pure water until they were properly struck, and vegetated well; then I began to irrigate them with solutions of ammoniacal salts containing $\frac{1}{1000}$ of salts in solution. The experiment was thus continued thirty days; during the months of June and July the cabbages throve, but I did not remark anything either good or bad; the effect of the irrigation with ammoniacal salts appeared completely inert.

The cabbages irrigated with the Seine water, took a similar development, and their weight, after the experiment, did not indicate any appreciable differences.

I shall afterwards return to the detail of these experiments, when I shall explain analogous ones, and shall discuss the theory of manures. Suffice it to add, that the ammoniacal salts did not produce any injurious effects because they were not absorbed; they were retained by the earth.

CONCLUSIONS.

1st. The following solutions of ammoniacal salts: sesquicarbonate, bicarbonate, hydrochlorate, nitrate, and sulphate of ammonia, do not furnish to vegetables the nitrogen which they assimilate.

2nd. When these solutions at $\frac{1}{1000}$ are absorbed by the roots of plants they act as energetic poisons.

INVESTIGATIONS CONCERNING THE FATTENING OF CATTLE, AND THE FORMATION OF MILK.*

BY MM. DUMAS, BOUSSINGAULT AND PAYEN.

All animals and all plants contain fatty matter; on seeing them accumulate in certain of their tissues, and undergo modifications, and sometimes disappear, the first idea of all observers must incline towards the generally admitted opinion, that fatty matters are produced by means of the food of the plant or animal, and by analogous processes, doubtless, in both kingdoms.

The investigations which we are about to detail, tend, on the contrary, to establish that fatty matters are formed only in plants; that they pass, quite formed, into animals, and that they are there immediately burned, in order to develope the heat which the animal requires, or are fixed, more or less modified, in the tissues, to serve as a reserve for respiration.

This last opinion is certainly the most simple that can be formed relative to these phenomena; but, before discussing the experiments which justify it, it is necessary to show how all the ideas which have hitherto been held concerning the origin of fatty matters, have been successively exploded. It would be useless to inquire what views the ancient chemists may have had on this subject; it is only from the origin of modern chemistry, that they have been led, by the more intimate knowledge of the composition of organic matters, or by the observation of some accidental phenomena, to form true theories relative to the formation of fatty substances.

It is thus, that at the time of the evacuation of the Cemetery of the Innocents, it was not hesitated to admit among the effects of the putrid decomposition of animal remains, the conversion of the muscles or viscera into fatty matter, properly so called. The fat of corpses, as the product into which the muscles, liver, brain, &c., of the exhumed bodies seemed to be converted, was called, was considered as the direct product of the alterations to which flesh, and in general the fibrinous portions of the tissues, were subjected for many years in the grave.

This opinion was afterwards supported by the experiments of Berzelius, who, having submitted fibrin to the action of energetic acids, as nitric acid, ascertained that fibrin was dissolved, losing nitrogen, and developing fatty matter. Indeed, if nitrogen be abstracted from fibrin, the remaining elements have a tendency to approach to the composition of fat.

But, on the one hand, M. Chevreul's investigations concerning the fat of corpses, have perfectly established its nature; they have proved that this substance contains the same acids as human fat; they are partially saponified by ammonia.

Gay-Lussac, on the other hand, has proved, by direct experiments, that fibrin, submitted to putrid decomposition, leaves, as a residue, a quantity of fat, which is not sensibly superior to that which the solvents may extract from it in the natural state. Whence it follows, that the putrefaction results in destroying the fibrin, and, consequently, in liberating the fatty substance which it contained.

In another circumstance, some chemists

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* *Comptes Rendus*, No. 7, Feb. 13, 1843.

thought that they recognised the formation of a fatty matter: this, in the action of nitric acid on starch during the preparation of oxalic acid; a fatty substance is, indeed, formed, but Chevreul has long since perfectly proved that this matter pre-exists, and that the reaction which destroys the starch sets it free.

It may, therefore, be affirmed, that all the opinions relative to these supposed formations by chemical processes have successively vanished, when submitted to careful examination.

Let us now investigate the results obtained by physiology. Carnivorous animals contain fatty matters, and they do not reject any by their excretions. It is in these animals, consequently, that it is easy to recognise when these matters come and how they disappear.

An examination of the progress of the digestion of dogs, speedily convinces us that their chyle is far from being an always identical substance. That which is formed under the influence of vegetable alimentation, rich in fecula or sugar, and that which arises from the digestion of lean meat, are equally poor in globules. These chyles are translucid, very serous, and yield very little to ether.

If, on the contrary, these animals be nourished with fat aliments, their chyle is very opaque, of a creamy aspect, and very rich in globules; it yields much fatty matter to ether.

These facts, observed by Magendie, and revised more in detail by MM. Sandras and Bouchardat, show that the fatty substances of our aliments, divided, or made into an emulsion by digestion, pass without alteration into chyle, and thence into the blood.

Donné has seen milk, injected into veins, remain several days in the blood. The butyrous globules remain, indeed, perfectly visible in the blood during a certain time, and it is not possible to be deceived in it. The fatty matters of our aliments may therefore be followed into the chyle, and thence into the blood, where they remain for a long time unaltered, and at the disposal of the organism.

Every chemist will be led to conclude from these observations, and from several facts connected with them, that the perfectly formed fatty matter is the principal, if not the only, product by means of which animals are made to regenerate the adipose substance of their organs, or furnish the butter of their milk. Such is also the opinion on this subject given by MM. Dumas and Boussingault in 1841.

This opinion gives rise to no doubt, so long as it is confined to the carnivora; but, in extending it to the herbivora, two difficulties are presented.

1. Do we find, in plants, sufficient fatty matter to explain, by its aid, the fattening of cattle, or the formation of milk?

2. Is it not more simple to suppose that the butter or the fat are the products of some transformations of sugar, easy to comprehend, from its constitution, and that of fatty matters?

It is so little natural, that the ox set to fatten finds in its aliments the fat which it assimilates, that, without having made a multitude of analyses of plants, and without having seen the fatty matters reappear throughout, and in a quantity almost always superior to that which is supposed in the vegetable organisms, this idea is not easily accepted. But it is in no way repugnant when one is convinced, as I have been in the investigations to which I have devoted the last ten years, that, in plants, a constant association of neutral nitrogenous matters and fatty substances, is almost always observed. I have seen this association, not only in the seeds, but also in the leaves and stems. It is thus that we have been led,—M. Dumas, by views of animal physiology, M. Boussingault, by agricultural considerations, and I, by my opinions concerning the physiology of plants and by my experiments on the composition of their tissues,—to adopt a similar opinion, and to submit it to the verifications of experiment.

According to this opinion, the fatty matters are formed principally in the leaves of plants, and they often affect in it the form and properties of waxy matters. In passing into the bodies of herbivora, these matters, forced to undergo in their blood the influence of oxygen, experience in it the commencement of oxidation, from which the steäric or oleïc acid found in fat, results. In undergoing a second elaboration in the carnivora, these same matters, oxidised anew, produce the margaric acids which characterise their fat. Finally, these different principles, by a still more advanced oxidation, might give rise to the volatile fat acids which appear in the blood and perspiration.

Provided that a complete combustion might change them into carbonic acid and water, and eliminate them from the economy.

Thus, taking our starting point from the wax of the leaves, we should see it pass, by digestion, into the chyle of herbivora, undergoing in their blood an oxidation which would form of it steärine and oleïne; thence, passing into the carnivora, the steärine, being further oxidised, becomes margarine. Finally, by a new oxidation, volatile acids, such as caproïc, capric, hircic and butyric acids, would in their turn be formed.

Although this system is very simple, it is difficult not to put on a parallel with it, an opinion very naturally based on investigations undertaken by M. Dumas, and which he has already communicated to the Academy. Indeed, sugar may be considered as formed of carbonic acid gas, water and olefiant gas. Now, there is nothing to prevent olefiant gas, on being separated, from assuming various states of combination, and from fixing water in such a manner as to give rise to ordinary alcohol, to potato oil, to ethalic alcohol, and to margaric alcohol, &c.

These various bodies, in being oxidised, would produce fat acids, and, consequently, fats. Since it has been known that oil of brandy of potatoes is met with in the brandy of the grounds of grapes, and the brandy of grains, and in the brandy of beet root molasses, the certainty that this oil is a product of the fermentation of sugar seems complete.*

It is, therefore, possible that, in the act of digestion, the sugar, giving rise to a similar or more condensed oil, intervenes in the formation of the fat of the herbivora; chemically speaking, at least, nothing is opposed to it; it is therefore impossible to explain the accumulation of fat in the carnivora, otherwise than by supposing that they derive it from the herbivora. But, with regard to the latter, admitting that they profit by that which the plants contain, it may be supposed that they produce a certain quantity of it, by means of a special fermentation of the sugar which forms part of their aliments.

The latter supposition becomes even more natural, when we see that the saccharine saps lose their sugar, when the flower and fruit are formed, as if the sugar of the saps were to form the oils or fats met with in the fruits or seeds.

If, notwithstanding these presumptions, favorable to the intervention of sugar, in the formation of fatty bodies in animals, we have adopted a contrary opinion, it is because facts have appeared to us completely in accordance with the latter, and entirely opposed to the hypothesis which would make sugar perform an essential part in the production of fats.

However, this hypothesis, to which we are opposed, is founded on two results worthy of all our attention, from the name of the observers to whom they are due, and from the consequences that flow from them.

The first was obtained by Huber, and it is relative to bees; the second belongs to Liebig, and relates to the fattening of geese.

Huber observed, indeed, that bees nourished with honey, or even with sugar, possess the property of furnishing wax for a long time. He even estimates the quantity of wax which sugar is capable of furnishing. All physiologists and chemists have copied Huber's results, without discussing them, and have admitted with him, that wax is formed in bees, by an act of their digestion, with any aliment whatever, with sugar, for example.

For our part, we should be inclined to believe that it is with a bee as with a nurse. If the latter finds in her aliments the fatty matter and protein which her milk requires, she produces milk for the child, and her health does not suffer from it. If, on the contrary, she be entirely or partially deprived of these fatty or albuminoïd aliments, she certainly still produces milk, and it is at the expense of her own substance that the milk is produced in such a case.

When we do not confine ourselves to examining whether bees nourished with sugar, make cakes of wax, and when we endeavor, on the contrary, to find how much weight they lose under such a regimen, and how much fat they lose, we shall probably arrive at a conclusion entirely opposed to that of Huber.

Bees continue to furnish wax more or less mixed with their own fat, for some time, when they are submitted to a purely saccharine regimen. Their wax then becomes more and more fusible, on account of the mixture of the steärine and oleïne, which Huber has proved. But, in these circumstances, their mass appreciably diminishes. This subject at the present time occupies the attention of M. Edwards; and, although serious difficulties may be presented, we believe that to him they will not be insurmountable.

Independently of Huber, Liebig has recently published opinions and experiments relative to the origin of the fatty matter of animals.

Liebig, like Huber, considers animal fats to be derived from the sugar or from the starch of the aliments. He endeavors to fortify this opinion, by chemical formulæ tending to prove that sugar and starch are converted into fat, losing oxygen. Liebig expresses himself, in this respect, in the following manner in a recent work:—

"Now, the relations between the aliments and the object which they have to fulfil in the economy, appear to us tolerably clear, since organic chemistry has examined them by the quantitative method.

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* The composition of the oil here alluded to represents an alcohol, whilst a substance of the nature of essential oils appears to be the origin of the characteristic odor of potato fecula.

"A lean goose, weighing 2 kilogrammes, increased about $2^{\text{kil}}\cdot50$, in the space of thirty-six days, during which, 12 kil. of maize were given to it, to fatten it; at the end of that time, $1^{\text{kil}}\cdot75$ of fat could be extracted from it. It is evident that the fat was not found quite formed in the food, for the latter contains only $\frac{1}{1000}$ of fat, or similar matters."

We are convinced that this experiment on the fattening of the goose is perfectly accurate; for its data agree with all that we know in this respect, according to what occurred at Strasburg, Dijon, &c.

But we do not comprehend that Liebig could be ignorant that maize contains any thing besides fecula, when it is sufficient to grind maize in water to make an emulsion, when indeed the analysis of maize, already published by one of us, give the following results:—

Starch	71·0	
Nitrogenous matters	12·0	in three distinct states.
Fatty matters	8·7	the one solid, the other liquid.
Cellulose	5·8	
Dextrine and sugar	0·5	
Coloring matter	0·05	soluble in ether, and especially alcohol.
Salts	2·0	
	100·05	

New experiments, in confirming all these facts, have shown us that the fatty matter of maize always amounts to from 7·5 to 9 per cent.

It will not be matter of surprise then that we, who know that maize is very rich in fixed oil, have derived, from its frequent and profitable employment in the fattening of animals, the conviction that it is by its fatty substance that this cereal fattens; whilst Liebig, persuaded that maize does not contain oily matters, comes to the contrary conclusion, and sees in the fecula of maize the origin of the fat of animals which feed on it.

We are perfectly persuaded that whoever will take the trouble, as we have done, to repeat the analysis of maize, will find, like us, that it contains nearly nine per cent. of oil. This quantity will appear less extraordinary, when we add that the cotyledon of the cereals is always very rich in oil; that that of maize, in particular, contains two thirds of its weight of it, and that this cotyledon is much more bulky in proportion to its fruit in the maize than in the other cereals. Hence nothing is more easy to explain than fattening from the use of this article of food.

It is very evident that the fattening power of maize, so universally applied, is in no way astonishing, and that the most simple manner of explaining it consists in admitting that the fatty matter passes in nature into the animals which consume it, and that it is fixed more or less modified. But, in the point of view which guided us, it was necessary also to account for the fattening power of certain products evidently less rich in fatty principles.

Thus it is very easy to prove, for example, that a cow in good condition, eating 100 kilogrammes of dry hay, furnishes 42 quarts of milk, containing about $1^{\text{kil}}\cdot5$ of butter. If our opinions were well founded, we should then find in dry hay 1·5 per cent. of fatty matter capable of producing this butter. Now, the analysis of various samples has given us 1·875 to 2·00 per cent.

M. Boussingault, without knowing of our experiments, was led by the same views to try the same experiments. Meadow hay and after-grass (*regain*) of good quality yielded him about 2 per cent. of fatty matters. In samples of clover cut in flower, the proportion amounted to 3 or 4 per cent.

It may, therefore, be affirmed, relying on the universal experience of agriculturists, that the hay consumed by a milch cow contains rather more fatty matter than the milk which she furnishes. We have no reason to regard this animal as capable of producing the fatty matter of her milk, and every thing tends to show that she takes it ready formed in her aliments.

It might be feared that there was some error, however, in thus comparing hay taken by chance, and the quantities of milk observed also by chance, although these might be averaged. A direct experiment, doubtless, is much better, giving the proportion of butter proved by analysis, relative to the fatty matter of the hay eaten by the cow, and itself analysed with care.

This experiment was made by M. Boussingault, with such care, and on such a scale, that we are persuaded that it will convince agriculturists.

The experiment lasted a year. It was made on 7 milch cows of the Schwytz race. This milk was measured with care at the two milkings of each day.

The seven cows yielded 17,576 litres (a litre is about 1 quart English) of milk, of the mean density of 1035. According to that the milk may be estimated at 18,191 kilogrammes.

Analyses several times repeated, and whose results varied but little, indicated in the milk 3·7 per cent. of butter completely deprived of water.

Whence it follows that the 7 cows yielded, in the year, 673 kilogrammes of butter.

During this time they each eat 15 kilogrammes of after-grass and clover per 24 hours; that is to say, in all, 38,325 kilogrammes during the year, for the 7 cows.

Now, if it be admitted that hay contains only 1·8 of fatty matter per cent, it is found that the 38,325 kilogrammes represent 689 of fatty matter.

If it be supposed that the mean proportion amounts to 2 per cent. we find in all 766 kilogrammes.

Taking into the account the employment of clover, which is still richer, it is evident that this quantity would even be far exceeded.

Now, the butter obtained amounts to only 673 kilogrammes.

Thus, in order to produce a quantity of butter amounting to 67 kilogrammes, for example, a cow eats a quantity of hay containing at least 69, and probably 76, kilogrammes of fatty matter, or even more.

The conclusion which it seems to us most natural to form from this experiment, is that the cow extracts from her aliments almost all the fatty matter which they contain, and that she converts this fatty matter into butter.

(*To be concluded in our next.*)

ON A NEW MANURING POWDER.*

BY DOMINIC FRICK ALBERT, LL.D.

This invention consists in a cheap method or methods of introducing into compost, or manure, such acids, alkalis and salts, as are required for the nutrition of plants.

A composition or mixture is first produced, consisting of four classes of ingredients; viz., 1st class,—Seven parts of ammoniacal water, from the gas works, or four of spent urical liquor, resulting from the scouring of woollen tissues, cloth, flannel, &c. 2nd class,—Six parts of human excrements, which should be passed through a riddle to free them from all extraneous matters. 3rd class,—Six parts of blood and animal gelatine, fibres, or tegument; all fleshes and skins being previously boiled to a pulp, to save grinding and chopping. 4th class,—Two parts of horse or cow dung. These ingredients are worked into a paste, in a large vat, or cemented reservoir; and their volatile ammoniacal gases are rendered stationary in the mixture, by the addition of from two to three per cent. of hydrochloric acid.

The composition is now mixed with a powder, composed of five classes of substances, which are as follows:—1st class,—Four parts of ground charcoal. 2nd class,—Two parts, of either chromate of lime, sulphate of lime, muriate of lime, or sulphate of alumina. 3rd class,—One part of ground schist, or pulverised and well dried aluminous clay. 4th class,—One part of vegetable ashes, or alkaline silicates, such as the refuse of glass-works. 5th class,—One part of common salt. This manure will dry into a powder if placed under a well-aired shed; or the drying may be hastened by means of a stove; but it will have a much quicker effect on vegetation when used in the damp state. It may be spread over the land with a spade, in the same manner as bone-dust, &c.

As some of the ingredients above-mentioned may not be readily obtained in various places, the patentee has mentioned a number of matters which may be substituted for them. The following are the materials that may be substituted for those which were employed in the preparation of the composition. 1st class,—Urine, in general, from man and beast, in the proportion of two parts of the former to three of the latter; or two parts of bone-dust, macerated in half its weight of sulphuric acid, may be used instead of five parts of urine. 2nd, 3rd, and 4th classes,—All sorts of animal refuse, such as tallow-chandler's grease bottoms, woollen rags, tanners' spent lime, containing much hair, scrapings and cuttings from hides and leather, offal from the dressing of sheep's feet, animal charcoal from prussiate of potassa works, cotton-spinners' waste impregnated with oil, the refuse from glue manufactories, and from cleaning foreign wools, &c. Instead of hydrochloric acid sulphuric may be used, to prevent the exhalation of any unpleasant smell from the composition.

With respect to the powder, those ingredients which may be substituted, are as follow:—1st class,—Equal quantities of soot and charcoal. 2nd class,—The refuse of those soaperies, where kelp is employed, can advantageously represent one half of the earths before-mentioned; pulverised oyster-shells also belong to this class. 3rd class,—The schist may be reduced to a powder by exposure to the rain, in place of grinding it. 4th class,—The soap-suds, or soapy water, produced in any of the different branches of manufactures, are received into a cistern, and the mineral powders, before alluded to, are added to them; the water evaporates, leaving the grease and caustic alkali combined with the other materials. 5th class.—The worst kind of rock-salt, or all kinds of sea-plants, dried and rubbed into a powder, or calcined, or the animalised spent salt, from the curing of pork, &c.

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* *Lond. Journal and Repertory of Arts*, April, 1843.

The patentee claims the combination of the materials, hereinbefore specified, in the proportions aforesaid, and the production thereby of a powder or manure, at a very cheap rate; which powder contains a more abundant quantity of such acids, alkalis and salts, as are required for the nutrition of plants, than any other manure now produced at an equally cheap rate.

PRODUCTION OF THE GUANO OF COMMERCE.*

BY DR. MATHIE HAMILTON, LATE OF PERU.

The Moro of Arica is situated close to the town, on the south, and is a bold promontory projecting towards the sea, its base being washed by the surf of the Pacific Ocean, and its summit being about 600 feet above it. This Moro presents a precipice nearly perpendicular, with numerous cliffs or ledges, which during ages have been occupied by myriads of sea-fowl, called garza by the Spaniards, but better known by the Peruvian name *guano*,—a term which is also used by the Indians for the dung of these birds. The front of the Moro of Arica is a most conspicuous and important object to mariners who wish to call there; for when vessels coming from the south, or windward, as it is there called, are allowed by those on board to pass the port, the space gone over in a few hours may be such as to require several days to beat up again to the roadstead. But in consequence of guanos nestling on the face of the Moro, it has a white appearance, from the accumulation of their droppings, which, when recent and dry, as it always is in that locality, is of a grey-white color, and serves both as a beacon to the navigator who approaches the place, and also as a magnificent object, when seen under the rays of the setting sun. The dung of the guano has been used for manure by the Peruvians, from time immemorial, and is highly prized by them, on account of its fertilising properties, which are very great. I have seen some of these inoffensive beings, who had come several hundred miles, having traversed ravines and tracks over all but impassable mountains, each one with his donkey or llama, for a quintal of guano, with which he had to march back again, trudging on foot, and often rejoicing over his odorous cargo. The guanos were still to be seen in vast numbers on the Moro of Arica, during my first residence there in 1826, but not in such abundance as they were a few years prior to that period; for during the war for independence, Arica was several times attacked, both by sea and land, when the cannonading had the effect of scaring the guanos from their haunts on the Moro. Since 1826, Arica has been much frequented by foreigners, some of whom often fired at, and otherwise annoyed these birds, which now have all but totally abandoned that part of the Peruvian coast. The guanos have hitherto existed on the coast of Peru, in numbers which would appear incredible, except to those persons who have seen them. The greatest mass of guanos I ever saw was in 1836, at the Chincha Isles, which are only barren rocks in the Pacific Ocean, off Pasco, and about 100 miles south from Callio. I saw the birds through a glass from on board a vessel under easy sail, when the rock appeared to be a living mass; for the guanos seemed to be contending among themselves for a resting-place. They live on fish, and are expert fishers, for which they are beautifully formed by Nature. The bill is three or four inches long, according to the age or size of the bird, and it is about one inch broad at the extremity, much curved, and altogether well adapted for hooking up the food, which rarely escapes. The quantity of guano manure accumulated on the Peruvian coast must have been very great, and may be estimated thus: allowing the average number of these birds to be one million, which I consider to be much within bounds, and that each guano has one ounce of droppings per day, we shall have not less than thirty tons, and deducting one half of the above supposed quantity for evaporation, and other casualties, there will still be above fifteen tons of this valuable substance produced every day. From what has been observed as to the habits and numbers of the guano, their frequenting promontories, declivities, and insulated rocks, it follows, that their excrements in certain localities must have accumulated to such an extent, as might induce those persons who have not considered the subject, to expect that the guano is to be had in unlimited quantity; but for obvious reasons, that must be a fallacious expectation.

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* *Jameson's Edinburgh New Philosophical Journal*, April, 1843.

ON MANURES AND THEIR COMPARATIVE VALUES.[*]

BY MM. BOUSSINGAULT AND PAYEN.

(*Continued from page* 171.)

FLEMISH MANURE.[†]

THIS manure, so useful in Flanders and Belgium, is composed of all the mixed products of the emptyings, which are kept liquid in large arched and closed cisterns; sometimes water is added and sometimes solid manures, such as cakes (*tourteaux*), in order to disaggregate them and make them swell up and imbibe the solution.

By rendering the temperature of the Flemish ditches very little variable, and by excluding the pure air, we have been able to greatly retard the fermentation; the great quantity of water which the manure contains furnishes to the soil at the time when it is spread on it, either in uniform irrigations, or in a mass near each foot of plants, which have been hoed, one of the most useful conditions to vegetation; if we add that the manure thus prepared, and although very dilute, promptly exhales assimilable gases, it will be understood how, notwithstanding its weakness, it may have an energetic immediate action. Finally, it should not be forgotten that this impulse given to vegetation renders the plant apt to profit more by the nutrition spontaneously presented to it by the surrounding atmosphere.[*]

Residue of Bone Glue.—Ground bones, as well as the bones called turner's waste, which are treated in the large way in autoclave boilers, analogous to Papin's digester, give very economically a more or less altered gelatin, soluble without the aid of heat; they leave a residue abounding in carbonate and phosphate of lime, but poor in nitrogenous matter,—so much the poorer as the soluble, humid and warm gelatin is decomposed in the air occasioning abundant ammoniacal vapors. As regards the nitrogenous substance which remains, it may be conceived that this must be partially composed of tissue not susceptible of being converted into gelatin ; that besides having resisted water at a temperature of 110° C., and the rapid fermentation of gelatin, it must for a long time resist atmospheric influences. These notions explain the little energy of the residue of bone-glue in the applications which it has been endeavored to make of it; it should, therefore, generally be regarded as inferior to its strength deduced from the nitrogen which it can yield.

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[*] *Annales de Chimie et de Physique.*

[†] We owe to the kindness of Professor Kuhlmann, of Lille, the following facts:—

Flemish manure is preserved in cisterns capable of containing from 2000 to 3000 hectolitres; manure is put into it in every season, that is to say, every time that the field work admits of it being carried from the town to the cistern. At Lille 25 cents. per hectolitre are paid for it. To be fit for use, it should have fermented for several months: to this effect, the cistern is never completely emptied; fresh manure is added to it in proportion as it is used; it suffers no loss in quality, even when thus kept for three years. Fermentation renders it rather viscid than liquid.

When it contains much solid matters, its action on vegetation is of longer duration than when it is in great part formed of urine; in the latter case it is not less esteemed, for then its action is more immediate; but in no case does the manure in question stimulate vegetation more than one year after it has been spread on the soil.

A hectolitre of fermented manure is equivalent to about 250 kilogr. of horse dung (half putrefied litter straw.)

Very general usage has consecrated the following rotation of culture:—

First year, in October or November: cover the earth with ordinary long dung, bury it with the plough, spread 600 hectol. of liquid manure per hectare; work again, and plant cabbage.

Second year: labor, spread from 120 to 150 hectol. of manure per hectare, and sow corn (in autumn).

Third year: 120 hectol. of manure, and sow oats (in autumn).

If the state of the roads, or some other circumstance, prevents the manure from being spread immediately before the sowing, it may be done in March, and then one-fifth less is required to obtain the same results; but this should be avoided as much as possible, because the horses and carts which have to pass over the field, in order to spread the manure uniformly, destroy a portion of the crops.

Sometimes cakes (*tourteaux*) reduced to powder are thrown into the cistern, but only when the Flemish manure contains too much water.

Cakes (*tourteaux*) are also employed in powder by sowing them dry on the plantations of cabbage, when some circumstance has prevented the manuring of the soil before the plantation.

After the plantation, it is impossible for carts laden with barrels to be got into the fields of colza, and then the cake (*tourteau*) is the only resource. The plants may without danger be irrigated with the liquid manure in all seasons, except during dryness. For moist lands, and in wet years, the manuring may be reserved; the corn is liable to be lodged.

In all cases an excess of manure is less injurious than a deficiency. For beet roots, as much as 1500 hectol. per hectare are usefully employed.

The quality of the manure is recognised by its odor, its viscidity when removed from the ditches, and its pungent, saline taste.

When the beet root is intended for the manufacture of sugar, the employment of Flemish manure is avoided. Experience has shown the bad effect of this manure on the quality of the beet root and its conversion into sugar.

[*] The sample of Flemish manure which we examined came from Lille; it was sent to us by Prof. Kuhlmann.

It will also be understood that in certain peculiar cases apparent anomalies have been presented by bones employed as manure, and independently of their quantity of nitrogen ; thus fat and dry bones which have absorbed the grease, in the first instance isolated, in their cavities, whilst they were humid, have then become difficult to decompose, if they are not very much divided, and they still resist for a long time. Ground bones heated in autoclave boilers, but with a different quantity of water, whether immediately dried to be set aside, or whether immediately spread on the earth, may be considered as active manures, for they contain soluble and very alterable gelatin.

Before speaking of disinfected manures, we must say one word more concerning some apparent anomalies, relative to residues known under the denomination of wood soot, sea sand, and sea and river mud, oyster shells and Picardy black ashes.

Wood and coal soot in general produce useful effects as manures : do they act in conformity with the principles we have laid down ? It might be doubted, because they are engendered in circumstances in which the organic matter exhales the volatile products of its decomposition ; but analysis has proved that soot retains a considerable quantity of these products.

That which arises from coal should be worth, according to its strength, 3½ times, and that of wood, nearly 3 times the same weight of farm-yard dung. The same explanation would apply to the goëmon, called burnt goëmon, but which retains sufficient nitrogenous matter to give directly ammoniacal vapors.

We might be astonished that the sea sands and the mud of the river of Morlaix were so justly estimated in Brittany, if we did not take into the account the fact that the nitrogenous substance, which, truly, is not very abundant, is not, as in turfs, accompanied by a great quantity of non-nitrogenous organic matter. The occasionally advantageous effect of oyster shells may also be explained in the same manner, and may be attributed to the calcareous amendment and saline stimulant which they introduce into the soil.

The sea sands most used in agriculture are designated in Brittany under the names of marl and *trèz*, or *tangue.*

Marl, also called sea sand, vermicular sand and *fond de corail* (*Millipora polymorpha*, var. *rubescens;* Esper, *P. flangenthiere; Millipora, Nullipora informis*, Lamark,) is chemically composed, for the most part, of calcareous concretions containing about 0·03 of organic substance, rich in nitrogen ; it is mixed with shells and various remains, and spreads a perceptible odor of sea-fish ; it is found in abundance in the sea and at the mouth of the river at Morlaix, whence it is obtained in considerable quantities for agricultural purposes. It is there, it is said, slowly reproduced ; now and then new banks of it are discovered.

The extraction of marl is made in lighters, by means of drags, from the 15th of May to the 15th of October ; the quays of Morlaix are covered with it at that season ; it is daily removed by cartloads, which are transported five leagues inland, a lighter forming seven of these loads, and weighing about 7000 kilogr., which sells at from eight to ten francs, a price which it appears must be raised, on account of the numerous demands of agriculturists. Marl is now obtained on the coast of Planeour-trez ; in the bay of Brest it is discovered near the river of Quimper ; finally, it appears that the sea-sand used by the agriculturists of the counties of Devonshire and Cornwall is of the same nature. In the *arrondissement* of Morlaix, from 14,000 to 28,000 kilogrammes of marl are employed per hectare of land ; the greater quantity is advantageous on moist and heavy lands, whilst it would have too much action on dry and light lands.

This appears to us to be owing to the easy decomposition of the nitrogenous substance of this manure, which allows of its being ranked in the class of hot manures, analogous to pigeon-dung, &c.

Marl, calcined in a tube, directly gives ammoniacal vapors, with very alkaline reactions.

Without doubt marl also acts efficaciously, on account of its abundant calcareous matter on the argilo-siliceous salts (soils ?) of Brittany ; peculiar and very advantageous effects, which may easily be understood, have been produced on lands containing efflorescent pyrites ; experience has also taught us that the addition of marl very much favors the action of dung. This manure is generally preferred as recently brought from the sea, before a commencement of disaggregation causes it to lose a portion of its qualities; all these practical facts perfectly accord with the theoretical data given in our general considerations.

(*To be continued.*)

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

SECOND ADDRESS TO THE PHARMACEUTICAL CHEMISTS OF THE UNITED KINGDOM.

It would appear almost preposterous to believe that any man in his sound senses could possibly be imposed on by the Pharmaceutical Charter: still, we fear that many have by its means been induced to join this Society, from a dread that this ROYAL CHARTER confers on that body the power of suspending from their practice such contumacious druggists as may dare to assert their disregard of it and its laws, and to persist in withholding from them the two guineas per annum for which they are so indecorously eager.

This charter, after all, endows the Society with not an atom of power; it merely confirms its rules; it gives it authority to regulate the admission of members; *that* it had before; but it has no power to compel chemists to belong to it; no, this will for ever be withheld.

We knew that this charter would be as inefficient as the Society itself, or we would most unhesitatingly have lodged a caveat, and would have carried on to the utmost our opposition; but we were too thoroughly convinced that the charter would give this ill-managed body no power over the trade.

The whole effect of the charter may be given in a few words:—It enables the Society to sue and be sued, to purchase property, &c.; in fact, it contains the usual provisions: to govern itself; to teach and examine candidates, and to grant its diploma to those who pass that examination.

Now, an act of parliament, for which they did not dare to apply, would have been quite a different thing: this, indeed, would have endowed them with the same authority as that possessed by the Apothecaries' Company.

This charter was granted on the 18th of February, 1843, but no exposition of its provisions was given in the March No. of the Society's Journal; a brief announcement on the cover was all the notice taken of it: it required some time and consideration before it was laid before the world; consequently, Mr. Bell deferred his explanation of it until the April No. He knew full well that the members would be grievously disappointed in this charter; therefore, he took time to consider how he might make the best of a very bad *job*. At last, however, the *denouement* takes place, and Mr. Bell writes an article extolling the wonderful Royal Grant, and endeavoring to impress the members with an extravagant idea of its value. It is our purpose on the present occasion to consider the effusion of Mr. Bell.

Passing over some extracts from the charter, selected on account of their being entombed in the obscurity of technical phraseology and legal verbosity, as being most eminently calculated to throw dust in the eyes of the contributors to the Society's Exchequer, we come to Mr. B.'s most sapient observations.

"By the provisions of our charter, our members are all recognised as chemists and druggists, and admission can, *in future*, only be granted to such as possess the proper qualification." So, the QUEEN has actually had the extreme sagacity to recognise them as chemists and druggists. We are glad to hear that "*in future*" no unqualified persons will be admitted; but the words "*in future*" would lead to the inference that hitherto they have not been so particular.

Mr. Bell goes on to boast of the extraordinarily high position enjoyed by corporate bodies, and exults in the glorious fact of the Pharmaceutical Society being possessed of a charter. "We began," says he, "by laying down a few *general principles* for our guidance, and organising ourselves into a private association for the purpose of testing their value." If Mr. Bell has discovered any *value* in them, we wish he would render it more evident to us, as we have not been so successful. But; "these principles have been confirmed by experience and sanctioned by HER MAJESTY, and we are therefore justified in assuming that they are approved by the Government; but we are still on the threshold of reformation, and it remains for us to apply our principles to practice in all their details." Confirmed by experience! why seven-eighths of the trade in this country have shown their disapprobation by not becoming members. HER MAJESTY'S sanction is a very doubtful affair, for we fear that she scarcely knows of the existence of such a Society; and even if HER MAJESTY had paid the most profound attention to the granting of this charter, we presume, with the utmost humility and deference, to doubt whether much importance may be attached to her opinion, especially when placed in opposition to that of seven-eighths of those most interested in the matter, and who are highly capable of judging of their own interest, and in contravention of the judgment pronounced on this Society by, without a single exception, the whole medical press of the country. As regards the approval of the Government, we cannot see that Mr. Bell has any right to assume this: the charter was applied for, and the application, not being opposed, was acceded to. Besides, the Government has exhibited such a total disregard of medical affairs, and has so long neglected to make any settlement of the present disturbed state of the profession, that it is not impossible nor even improbable that the charter was granted without proper consideration.

The opinion of HER MAJESTY is entitled to our respect, from HER MAJESTY'S station; but that of seven-eighths of the druggists, and of the entire medical press of Great Britain, is much more likely to be based on correct data. Besides, if we may judge by the misrepresentations contained in the article under consideration, it is by no means improbable that HER MAJESTY and her Government may have been deluded by garbled statements. We accuse no one of *wilful* deception.

In our first address, we stated that it is the intention of the Government, in the forthcoming Medical Bill, to confer on the College of Physicians, and not on the Pharmaceutical Society, the power of examining and licensing chemists; and since that statement was made, we have had still stronger reasons for believing that such is the determination of the Legislature. We perceive, moreover, that Mr. Bell is far from confident that the power will be vested in the Society. Mark the *rather* hopeless tone of the following passage:—* * * * "and it is no less certain, that unless we persevere until we have accomplished what we have undertaken, we may still be placed under the jurisdiction of others." Yes, it will come to this: great court influence will obtain for the College of Physicians that power which the Pharmaceutical Society in vain will sigh for; and if the council of the latter body should endeavor to enforce its claims, the reply will be: "Why, more than seven-eighths of your brethren are against you; the medical press has made weighty complaints against you; and we cannot confide in men who have abused the confidence reposed in them, and must decline giving you the opportunity of doing further mischief."

Mr. Bell says, that the proceedings of the Society "are narrowly watched by influential members of the profession, who will immediately interfere, if any evidence of inefficiency or lukewarmness, on our part, should be observed. It should, therefore, be our policy, not only to secure what we have already achieved, but also to obtain from the Legislature such powers and privileges as could not be conferred by charter." Yes, indeed, a watchful guardianship is being kept up, and we are among the most vigilant. If they expected to obtain greater powers and privileges, why did they go to the expense of that which will be superseded? Because they knew full well that it was all they could ever get.

He next notices a proposition "lately" made by the country members to reduce the amount of subscription, and says, that they "have not considered the matter in all its bearings, and overlook the circumstances under which the institution originated;" but he declines recapitulating "these circumstances," under the very stale pretext of their having been "so fully detailed" on former occasions. He adds in a note, that, "at the time that the druggists were associated for the purpose of opposing the objectionable clauses in the Act of 1815, no School of Pharmacy, Journal, or Benevolent Fund, were contemplated, yet the sum of two guineas was fixed upon as the amount of subscription." Surely this answer cannot satisfy those to whom it is addressed. Certainly, in 1815, it was resolved no subscription of less than two guineas should be received; but this subscription was not *annual*, a circumstance which it would have been more candid in Mr. Bell to have acknowledged. But candor must not be hoped for from that quarter.

With regard to the School of Pharmacy, the Society has no right to teach those whom it will afterwards have to examine; and at any rate, it should be made to pay its own expenses: students are charged for the lectures; this, therefore, must be deducted from the answer given to the country subscribers, who, moreover, are too far off to participate in the advantages it affords.

The Journal should not be thrust upon every member, whether he desires it or otherwise; it ought to be optional with every one whether he purchases it or not. We suggest that, in future, it be left to each member to take it or not. This, however, would not suit Mr. Bell; he knows that in such a case, he would find the Journal a very unprofitable speculation. But, as it would be an act of wisdom and justice, we dare not expect so much of the Society. We cannot see why men should be compelled to buy trash against their will.

If the Society abandon the project of a School of Pharmacy, and leave it optional with members to take in their Journal, they can well afford to reduce the subscription to one guinea; or the metropolitan members might pay £1 10*s.*, and the provincial ones 15*s.* per annum. No disadvantages could attend such an alteration. The School of Pharmacy is not necessary, as the future druggist could be educated at other schools, and go to the Society for examination and a diploma. As for the Journal, that would stand on its own merits, and a necessity on the part of the person conducting it for maintaining its sale, would compel him to devote such care to its management as would, doubtless, tend to its improvement; whereas, now, while every member *must* have it, be it good, bad or indifferent, he may reasonably be supposed to relapse into carelessness as to the character of its contents.

This reduction of the subscription would, we feel assured, with proper management, end in the realisation of all the hopes of the Society; additional members would flock in, and there would be but few druggists who would not join it. So numerous would they become, that the Legislature might then, perhaps, be induced to vest in them the power of examining and licensing. But we speak to the deaf. Our suggestions are thrown away.

We do not expect that the questions contained in our last Address will be replied to; but if they be not, our readers will perceive that the Society cannot defend itself, and that our questions are unanswerable. If they be answered, we must request chemists to read our reply before they form any conclusion.

If Mr. Bell replies to our questions, we shall rejoin in our next Number. Until then, therefore, we postpone the further consideration of this important subject.

THE PHARMACEUTICAL SOCIETY —"THE SELF-DUBBED REPRESENTATIVE OF THE CHEMISTS AND DRUGGISTS OF GREAT BRITAIN."

To the Editors of The Chemist.

GENTLEMEN,—

Your analysis of the Pharmaceutical Society and able *exposé* of its workings, in the last No. of THE CHEMIST, have been read with great satisfaction by those to whom it is more especially addressed, and also with considerable interest by the non-medical part of the community: your concluding remarks are therefore looked forward to with a corresponding degree of anxiety.

The pretensions of this Society are certainly very great; but as regards its practical utility, what has it effected for its supporters? literally nothing; it is therefore not at all astonishing that some of the members should be dissatisfied, and others altogether withdraw; the only matter of surprise is, that, composed of such elements of discord, it should have existed so long as it has.

Had the Society been founded on a broad and liberal basis, without any sinister motives in its composition, it would have realised the expectations formed with regard to it; but, perhaps, emblematic, and phœnix like, another and a better Society may spring up on the ashes of its dissolution; such must naturally be the common fate of all institutions and governments in which the machinery works for the benefit of the *few* instead of the *many*.

It were a fallacious hope to expect your interrogatories to be answered satisfactorily, if at all, by the Society; some of them are of so biting and caustic a nature, as to make them wince again, independent of their being so pertinent and necessary; but we shall see when they issue their next "*valuable*" Journal of Transactions, what progress they have made towards answering the questions put by THE CHEMIST; in the mean time, it is the duty of every one connected with the Trade to disabuse the public mind, and satisfy themselves that the assumption of the Pharmaceutical Society as the representative of the great body of Chemists and Druggists is absurd and preposterous, as it does not embrace one eighth part of them.

I am, Gentlemen,
Respectfully yours,
PATRIOTICUS.

April 20th, 1843.

THE PHARMACEUTICAL SOCIETY.

To the Editors of The Chemist.

GENTLEMEN,—

On reading your Address to the Pharmaceutical Chemists of the United Kingdom, I feel impelled to offer my thanks for the information you have there afforded; at the same time, I have myself from the commencement viewed the whole proceedings of the Council with considerable suspicion, and had it not been a matter of principle with me to contribute my mite towards the necessary expenses incurred in fighting the battle against our opponents, I do not think, under its existing laws, I should have joined the Society; in addition to this, however, I was confidently assured that some measures framed or approved of by the Council were very shortly to be brought before Parliament, to protect the Chemists and Druggists, as well as the public, against unqualified persons entering upon a business of such great responsibility. It seems, after all, that the mountain apparently pregnant with so great things has hardly yet brought forth a mouse. Yes, the mouse (the Charter) is born. Will it long survive the labor?

Having paid two years' subscription, I consider myself now free from any imputation as to illiberality as regards past expenses. Of course, I shall wait until the next subscriptions become due with my eyes open, and your help; and then, unless something more decided is accomplished, and the country members more equitably dealt with, I shall certainly withdraw any further support.

It is now very plain that the unhandsome treatment you met with from the leaders of the Pharmaceutical Society has got them into a scrape, which they will find requires more tact and ability to escape from than they ever anticipated.

Wishing you all success in your undertaking,

Believe me to remain,
Sincerely yours,
G. M. H.

April 14th, 1843.

[We select this and the preceding letter from among a vast number which we have received, and all of which thank us for our Address to the Pharmaceutical Chemists of the United Kingdom. It gives us great pleasure to be able to inform our readers that chemists are now beginning to open their eyes.

We shall most willingly and gladly receive any communications relative to the Pharmaceutical Society.]

TREATMENT OF GOUT WITH CARBONIC ACID GAS.*

BY J. PARKIN, ESQ.

In a letter to the Editor of *The Lancet*, Mr. P. says:—"In a work that I recently published, with the express object of recommending a particular remedy for the cure of that painful and intractable malady, gout, it was stated that, so far as my own experience went, the remedy in question, carbonic acid gas, shortened the paroxysms, and lengthened the intervals of attack to a greater extent than any other with which I was acquainted; that attacks which before had lasted two or three months, were reduced in the end, and after the lapse of some years, to as many weeks or days; while the disease itself, instead of returning twice or three times every year, was only experienced every second, third, or fourth year. Two cases only were there given illustrative of the efficacy of the remedy; one showing the effect during a paroxysm, and the other its ultimate result. Although these cases were considered to be sufficient at the time for the object contemplated, I was in hopes that some of my professional brethren would, ere this, not only have given the remedy in question a fair and proper trial, but have also been induced to make the result of those trials public; for it was in this hope and expectation that I published the work in question. Being disappointed in this respect, however, and having received several private communications on the subject, I have selected the following case, thinking that the history of it would not be unacceptable to the readers of The Lancet.

"The writer is an English gentleman, resident in Barcelona, who, having experienced an attack of gout last Spring, wrote to me for directions respecting his own case, and, subsequently, to that, the history of which I am now about to relate. Although the same result has been obtained in both instances, I have not deemed it necessary to give the particulars of the former, in consequence of the case being a mild and recent one. After speaking of the satisfactory state of his own health, the writer thus continues:—'You must know, then, that your remedy appears to have effected a radical cure in the patient who has been under my charge since last June. It is such a striking case of the success of your treatment, that it really deserves to be added to the work, and I regret very much that I am so little qualified to draw up a report for that object. I could, however, get something like a deposition from the patient, attested by respectable witnesses, if such document could be of any service in making known the wonderful effect of *carbonic acid gas*.

"'The person in question (a Spaniard) is about forty years of age, and has suffered very severely for about fifteen years, with three or four attacks every year, of the most severe kind, the disease generally commencing in the hands and feet, and extending itself to the elbows, knees, shoulders, &c., and on one occasion to the testes. He describes the agonies he used to suffer as so great that he has frequently called on those about him to put an end to his existence. His fingers are distorted and crooked; and, in short, although it may be an improper remark on such a serious subject, he went by the nick-name of 'commander of the gouty legion.'

"'The draughts (effervescing) were given to him, in the first instance, at the onset of an attack in the right hand, brought on, as he supposed, by a fit of passion the preceding day. The inflammation subsequently reached the elbow, but went no farther. He complained, however, of the pain this time being even greater, if possible, than he had suffered before; and being an ignorant man, had got it into his head that it was owing to the disease not being able to spread as usual, by which all its malignity was concentrated in one spot. I made him take the draughts every three hours, supplying out of my own stock of French soda, not trusting to the Spanish, which, you know, is inferior. In three days he came round, the violence of the pain and inflammation having subsided, after which he only took the draughts three times a-day, until all symptoms of the attack had disappeared.

"'After this he continued quite free from the disease for three months, when symptoms of another attack were felt; but, full of belief in the efficacy of the remedy, he passed the first or better part of the night in taking a draught every two hours, or even more frequently, till at last sleep came over him, and when he awoke late in the morning every symptom had disappeared, and he found himself as if he had been dreaming and quite well. From that time to the present (now five months) he has had no signs whatever of the distemper.'

"It is right to state that, in addition to the effervescing draughts, I advised the patient, as soon as the intensity of the attack had subsided, and the inflammation had partially disappeared, to take a few grains of blue pill every other night, and an electuary composed of sulphur and magnesia in the morning. When the latter combination was not found sufficient, I ordered an aloetic preparation to be added to the blue pill, so as to keep up a gentle action on the bowels. A slight aromatic tonic was taken for some weeks after the attacks had entirely subsided. This, or some other plan of treatment, varying, of course, according to circumstances, will always be requisite in old and severe cases, for the administration of a remedy like carbonic acid gas cannot of itself be sufficient to remove effects that have resulted from long and repeated attacks,—if, as I infer, this agent acts only by removing the cause of the disease, the presence of a morbid matter in the system. In mild and recent attacks the removal of the cause will generally be sufficient to remedy the effects, but, in other instances, such a result cannot be expected. If, however, we have the means of removing the cause with skill and certainty, the task of remedying the effects will be, comparatively speaking, an easy one, except in those cases, but too frequent, alas! in which organic disease has resulted from long continued attacks of the disease.

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* From *The Lancet*, April 8, 1843.

In closing these remarks I am bound to add that the result obtained in so old and intractable a case as that under consideration, appears to be greater than what I have myself experienced; and I am induced, therefore, to ascribe the difference to a circumstance that has been before dwelt upon by me, viz. that in Spain the type of most diseases is milder, and that the cases are less complicated than in this country;[*] not that I infer, with the reporter of the above case, that a radical cure has been effected, if, by "radical cure," he meant a *total* exemption from future attacks. This must be apparent from a slight consideration of the subject, for if the remedy in question acts only by removing the immediate, not the remote cause of the disease, no matter what that cause is, whether external or internal, the individual must always be liable to be again brought under its injurious operation, and so experience its effects to a greater or less extent the same as before the first attacks of the disease. If, however, the facts before mentioned are to be depended on, instead of the attacks continuing three or four months, and returning two or three times a-year, they will be in the end, and after the lapse of some years, reduced in duration to as many weeks or days, and be experienced only every second, third, or fourth year.

Dover Street, March 29, 1843.

APPLICATION OF NITRIC ACID TO EXTERNAL HEMORRHOIDS.[*]

BY DR. HOUSTON.

Dr. H. prefers the use of nitric acid to every other kind of chemical application, and to excision. The following is the mode in which he applies the acid, as described by him in an article in the March No. of the *Dublin Journal of Medical Science*:—

"Let the patient strain at the night-chair, so as to bring the tumours fully into view; and, while they are so down in the bent posture on the side on which the disease exists, with the buttocks over the edge of the bed,[†] let a piece of wood, cut into the shape of a dressing-case spatula, be dipped in the acid, and then, with as much of the acid adhering to it as it will carry without dripping, let it be rubbed on the tumour to the extent desired. The due effect of the acid on the part is shown by its changing it to a greyish-white color. If a superficial slough be all that is required, a single application may be enough; if a more deep one, then two or three applications of the wood dipped in the acid may be made in quick succession; which being finished, let the part be well smeared over with olive oil, provided beforehand for the purpose. The prolapsed parts should then be pushed back within the sphincter, the patient put to bed, and an opiate administered. The pain of the application is sharp and burning at first, but goes off in two or three hours, and does not again return in the same form. A general uneasiness about the anus, on motion, together with a slight sense of heat, fulness and throbbing, are felt for a few days; and there may be some little feverishness; but I have not seen or heard of any more serious effects from the remedy. In Case II. a slight stranguary, which was experienced for a short time, disappeared under the *mist. camphoræ c. opio.* The symptoms following the application of the acid are usually so mild as not absolutely to require confinement to bed more than a few hours; although, for many reasons, such confinement may often be desirable. On the third or fourth day, a purgative draught should be administered, when the bowels will be found to yield to the medicine, generally without either pain or prolapse of the rectum. The progress after this to healing is rapid, and free from any disagreeable symptoms.

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[*] *Vide Lancet*, May 12 and 19, 1838, "On the State of Medicine in Spain."

[*] From the *Dublin Journal of Medical Science*, March, 1843.

[†] I may here observe, in passing, that any introduction of the finger into the rectum immediately before the operation should be avoided, as the pressure made thereby on the tumours will so reduce their bulk, that they will not for some time come down again sufficiently for the purpose desired. I mention this, because I have seen both patient and surgeon disappointed, by being obliged from this cause to defer the operation to another day.

POISONING FROM LUCIFER MATCHES.*

BY R. A. LAFARGUE, M.R.C.S.L.

On November 30, Mr. Young, house-surgeon to the Leicester dispensary, requested me to assist him in examining the body of a little girl, aged six months, who five days previously had sucked the ends of several lucifer matches, commonly called "Albert and Victoria." The following are the symptoms as given me by Mr. Denton, the medical attendant, and the parents.

About eight hours after sucking the matches, violent sickness came on, which continued during a night and day; the matter ejected being luminous, and, as well as the breath, emitting a strong phosphorescent odor. After the cessation of the sickness, the child lay in a drowsy, stupid and comatose condition, till within a few hours of its death, when it was seized with convulsions, and died in one of the paroxysms. The bowels during the whole time were sluggish, requiring frequent exhibition of enamata to cause evacuations.

POST-MORTEM APPEARANCES TWELVE HOURS AFTER DEATH.

On opening the abdomen, the peritonæum presented nothing abnormal. Near the pyloric orifice of the stomach a large injected patch was seen, the mucous membrane being thickened and softened. The duodenum and jejunum were quite in a healthy state; along the whole course of the ileum, several oblong patches, from half an inch to three inches in length, attracted notice, the mucous membrane being thickened, softened, and, in many places, ulcerated; the colon and rectum were healthy; the liver was larger, paler, and more indurated than natural; the lungs and pleura were healthy; the pericardium contained from half to one ounce of fluid; neither the brain nor œsophagus were examined.

EMPLOYMENT OF NITRATE OF SILVER.

A great objection to the use of the nitrate of silver internally, for any length of time, has been the discoloration of the skin which is in general caused by it, and which has hitherto unfortunately proved to be permanent. Dr. Patterson, of the Rathkeale Infirmary, has made this a subject of inquiry, and has published his experiments. He does not believe the nitrate reaches the stomach undecomposed, but is inclined to believe that, ere it enters that viscus, it is changed into the chloride; and the discoloration he attributes to the decomposition of the chloride of silver circulating in the cutaneous tissue through the chemical action of the sun's light, and the deposition there of its metallic basis in a state of extreme disaggregation. All persons are not subject to this accident, for the influence of the sun's rays can only be effective in those cases where the cutis is more than ordinarily vascular, and is clothed with transparent cuticle. To avoid this discoloration, and yet receive the full advantage of the tonic powers of the silver, Dr. Patterson advises the employment of the ioduret, which is uninfluenced by the sun-light. It is easily prepared, by adding to a solution of the nitrate, in distilled water, a solution of hydriodate of potash in atomic proportions. If 164 grains, or one proportional of ioduret of potassium, be dissolved in 2 or 3 ounces of distilled water, and 172 grains, or one proportional of nitrate of the oxide of silver, be dissolved in two or three other ounces of distilled water—on mixing the solutions 234 grains, or one proportional of ioduret of silver, are precipitated. The whole is then to be thrown on a filter, and the ioduret of silver should be washed with repeated affusions of rain or distilled water, and then dried in the sun or before a fire. If the ioduret of silver, so formed, be in the slightest degree contaminated with any nitrate remaining undecomposed, it will be liable to discoloration. It is, therefore, best to use the ioduret of potassium in very slight excess, and, for facility of practice, equal weights of each salt may be employed. Ioduret of silver, thus prepared, is a soft, rich looking, granular powder, having the beautiful pale greenish yellow color of the canary bird. It has neither taste nor smell, and is insoluble in water; it resists the action of the diluted nitric, hydrochloric, and acetic acids, of the alkaline subcarbonates, and of hydrochlorate of soda; it is very sparingly soluble in a solution of hydriodate of potash. Dr. Patterson has found the stain caused on the skin by the external application of nitrate of silver removed by a solution of the hydriodate of potash, and has further ascertained, that nascent iodine will discharge the writing of indelible marking ink, made with the nitrate, and thence concludes, somewhat too hastily, that the discoloration from the deposition of the silver in the skin may be removed by the internal and external employment of suitable preparations of iodine, forgetting the impossibility of applying his remedies directly to the rete mucosum, where the oxide or metallic silver is deposited, and also not taking into account that, although the iodine may influence the stains caused by the nitrate, it does not follow that a similar effect will be produced on the reduced metal.—*Med. Times;* from *Dub. Med. Press.*

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* *Provincial Medical Journal, and Lond. and Edin. Monthly Journal of Med. Science*, April, 1843.

TWO CASES OF POISONING FROM THE APPLICATION OF A CERATE CONTAINING ARSENIC, PREPARED FROM NEWLY-MADE WAX CANDLES.*

BY DR. ERRARD.

A MAN fifty-three years of age, who was suffering from pneumonia, but was convalescent, had two blisters applied, one on each arm. The wounds were both dressed with ointment. Next day Dr. Errard was sent for early in the morning, and on his arrival, he found the patient in the following state: the arms were painful; the tongue was red, dry, and cracked; he had urgent thirst, with a quick, small, and irregular pulse; pains in the abdomen, but no purging; and involuntary contractions of the muscles of the inferior extremities: there was also head-ache. The patient died in the evening. Dr. E. suspected poisoning; but on the relations denying that he had taken anything hurtful, the investigation was not pushed further. The second case happened eight days after the one just related. A blister was applied on the thigh of a young woman who complained of headache from suppressed catamenia; it was afterwards dressed with ointment, which caused such pain, that the dressing was removed. Upon Dr. Errard's visiting her, he found her complaining of great thirst, with nausea and pain in the epigastrium. The tongue was red, the wound was inflamed, and there were twitches in the limbs. In a few days she was quite well. In a child the application of an ointment to a sore on the nose, increased rather than improved the ulcer. On inquiry, it was found that in all the cases the ointment was got from the same shop, and that it was made from wax candles containing arsenic. No chemical examination of it, however, took place; but the cases, Dr. E. says, may be of use in informing the public of the composition of these candles, as in almost all the villages a cerate is made from the remains of the lights employed in the churches; lately, the candles have been made from lard hardened by arsenious acid.

DELIRIUM TREMENS TREATED BY AMMONIA.*

DR. SCHARN, of Katscher, considers this affection in the light of intoxication at its maximum of intensity, and acting on the faith that ammonia is the most suitable remedy against the effects of ardent spirits, he has recourse to the succinate of that base on a fit of delirium occurring; and he states that he has witnessed the most aggravated cases of the latter succumb to this remedy in a few days.

CASE OF POISONING BY NUX VOMICA†.

BY DR. LEONHARD.

A LADY, 50 years of age, of delicate constitution, and long subject to abdominal affections, after having tried a vast number of medicines, was put upon a mixture of one drachm of the tincture of nux vomica to two ounces of menstruum, a teaspoonful to be taken three times a day. Scarcely had the patient taken the first dose of her new medicine, however, than she was seized with very alarming symptoms; she had first a violent shivering fit; then the face became flushed; the eyes were set fast in the head; the features distorted, the mouth close shut, the teeth being ground from time to time; the breathing was rapid, noisy, and interrupted. The patient was in agony, suffered from violent palpitation, and frequently screamed aloud; at the same time the head was drawn forcibly backwards, and the mouth widely opened; the tongue was projected from the mouth, and then, by the convulsive snapping together of the jaws, severely wounded. The patient swallowed fluids reluctantly, and with great difficulty; sometimes she could not swallow at all. The patient was obviously suffering from an over-dose of some medicine containing strychnine. As the patient had already produced vomiting, the liquor ammonii anisatus was had recourse to, first in doses of from 20 to 30 drops in a little sugar and water, at first every five, and then every ten or fifteen minutes. Under the use of this medicine all the alarming symptoms rapidly subsided, and the patient finally recovered. On questioning the apothecary's lad who had made up the medicine, as to what he had done, he at first declared that he did not know how strong the tincture of nux vomica was which he had dispensed, or what other article he had substituted for it; but some hours later, he owned, that instead of the *drachm of the tincture*, he had, through an "unhappy mistake," substituted *two drachms of the spirituous extract* of nux vomica!

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* Abridged from *Gazette Med. de Paris*, 5th Nov., 1842; as given in the *Lond. and Edin. Monthly Journ. of Med. Science*, April, 1843.

* *Casper's Wochenschrift*, and *Lancet*, April 22, 1843.

† *Medicin. Zeitung. vom Preuss. Verein*, No. 50, Dec. 1842. As given in *Lond. and Edin. Month. Journ. of Med. Science.*

AMMONIURET OF COPPER AS A CURE FOR EPILEPSY.*

BY DR. MERCURIO.

Every thing relating to the treatment of an affection so painful, and so generally reputed incurable as epilepsy, should be laid before medical men; for the opportunity of proving the imperfection of therapeutics on this point, presents itself to them as often as they require to try its pretended riches. We therefore hasten to make known this new means of cure. Unfortunately some circumstances of the present observation prevent us from basing on the extolled medicine the hope that it will be as successful in all cases of this kind. Indeed, 1st, it refers to a case of very recent epilepsy; 2nd, it proceeded from excessive masturbation; 3rd, a marked amelioration of the symptoms had already been obtained by the employment of different medicines, when the administration of the ammoniuret of copper was commenced; 4th, finally, this substance itself, (given during two months in doses gradually raised to half a grain,) was always combined with castoreum and assafœtida. Now, it is evident that this mixture which, doubtless, adds to the efficacy of the remedy, is no less an obstacle to the precise determination of the value of each of its components. Be it as it may, the fits which occurred once and twice a day became less frequent. At the time that the observation was published, seven months had elapsed since the last fit. This is, therefore, a new fact in favor of the treatment already advocated by Belfour, Rousset, and Frank.

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* *Il Filiatre Sebezio.*

ON THE USE OF THE PREPARATIONS OF SILVER IN SYPHILIS.*

BY DR. SALVOLINI.

The use of the preparations of silver and gold in syphilis is now in very general discredit. But, in justice, it must be acknowledged that they owe this indifferent character less to an absolute want of action than to the very certain and decisive action of mercury. It is the superiority of the specific that has obscured its substitutes. It is important, however, to restrain this judgment within certain limits; for, without pretending to claim for gold and silver an exclusive preference, we have too often been driven to the employment of these valuable agents to join the ranks of those who would proscribe them. The second rank is all that we claim for it; but there would be, it seems to us, injustice and imprudence in refusing this to it.

The too brief work of Dr. Salvolini is a pleader in favor of the preparations of silver. Less irritating to the stomach and lungs than mercury and gold, they have also the advantage over these two medicaments, of not exciting salivation, and over the second, of being of a price more within the reach of patients.

As regards the mode of administration, the author prefers, with M. Serre, the chloride, and the ammoniacal chloride of silver to the oxide, cyanuret and iodide, as well as to the divided metal. But he differs from the professor of Montpelier in giving it in larger quantities. The following are his most ordinary formulæ:—

Chloride of silver, $\frac{1}{10}$ of a grain for friction on the tongue. Repeat this friction four or five times a day.

For ulcers and vegetations, cover the diseased parts with a pledget, endued with an ointment made with oxide of silver.

Iodide of silver, $\frac{1}{10}$ of a grain for a pill, five of which are taken daily. After six days the quantity is raised to $\frac{1}{6}$ of a grain for each pill, of which four are taken.

Cyanuret of silver, $\frac{1}{10}$ or $\frac{1}{8}$ of a grain for a pill. Same dose as for the ammoniacal chloride of silver.

Dr. Salvolini gives only four cases in support of these precepts. All are far from conclusive on the question. We will limit ourselves to giving the title of them, waiting for a more extended work, which the physician of Rimini promises.

1. Syphilitic vegetations on the margin of the anus and on the perineum. Chloride of silver in frictions on the tongue, and oxide of silver ointment. Cure in 27 days.

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* *Il Raccoglitore Medico.*

2. Venereal (?) Gonorrhœa. Employment of iodide of silver in pills. Cure complete on the 25th day.

3. Ulcers on the gland and the throat. Administration of cyanuret of silver in pills, and local application of ointment of oxide of silver. Cure in 23 days.

4. Numerous condylomes round the anus; nocturnal osteocapic pains. Ammoniacal chloride of silver given in pills, application of ointment of oxide of silver. Cure in 25 days.

FATAL DOSE OF SULPHATE OF QUININE.*

In a late number (No. 113) of this Journal, we published a memoir of M. Briquet, on the use of sulphate of quinine in large doses in acute rheumatism. The following case, however, shows that this remedy cannot be employed in the doses mentioned by M. Briquet without danger:—

A man, 26 years of age, was received into the Hotel Dieu, under the care of M. Recamier, on the 27th of November, 1842, laboring under acute rheumatism. His skin was hot; pulse frequent and hard; no affection of heart and lungs; no headache; both wrist-joints were very much swollen and painful; the skin was slightly red; some pain also in the knees. M. Recamier, who had just seen a favorable example in town, of the treatment with large doses of the sulphate of quinine, resolved on trying it in this case. He ordered 48 grains, in 12 powders, one to be taken every hour. On the following day the pain in the knees was ess, but in the wrist-joints it was aggravated. The heart was carefully examined; no *souffle* ould be detected, but its pulsations were ess distinct than is natural. On the next day 12 grains of the sulphate were ordered, 6 to be taken every hour; but after the eighth dose the patient was suddenly seized with iolent agitation, followed by furious delirium, and died in a few hours.

On examination of the body, marks of evere inflammation of the cerebral membranes were discovered. An analogous case, in which very dangerous symptoms supervened after the administration of 4 scruples f the sulphate in 12 hours, occurred about he same time, in the wards of M. Husson.

ACETIC CATAPLASM IN WHITE SWELLINGS.†

BY SIGNOR GAMBERINI.

THE author has obtained good effects from his cataplasm, not only in white swellings, but in local rheumatism, sprains and serious contusions. It is prepared by boiling for half an hour, in a close vessel, a mixture of bran and strong vinegar. At the end of that time, the mixture is spread on a cloth, as in the case of ordinary cataplasms. A constant phenomenon of its employment is the eruption of granulations, which ulcerate and cicatrise in a very short time. This powerful resolutive appears to possess greater efficacy than any other agents of this nature.

ON THE EFFECTS OF THE HYDROCYANATE OF ZINC IN NERVOUS DISEASES.*

BY DR. AUGUST BARTELS.

THE writer gives the particulars of three cases, one of epilepsy, one of a strange form of hysteria, approaching to mania at times, and one of eclampsia,—a convulsive or epileptiform disease,—in which the medicine above named was employed with the best effects. It was generally begun in doses of half a grain twice a day, and gradually increased, till 2 grains were taken 3 times a day. This preparation seemed to succeed in cases where the sulphate of zinc, sulphate of copper, and ammoniuret of copper had failed.

Dr. Bartels, however, found that the hydrocyanate of zinc could not be borne in every instance. He gives the brief particulars of the fourth case, in which doses so small as one fourth and even one eighth of a grain occasioned vertigo and severe vomiting, so that the medicine had to be abandoned.

TANNIN IN HOOPING COUGH.†

M. LEBREGONDI has found decided benefit from the employment of pure tannin in the asthenic stage of hooping-cough. He has administered it in doses of a quarter to half a grain every two hours, in conjunction with sedatives, as extract of hemlock, &c., or purgatives, as infusion of senna, under which treatment the paroxysms have entirely ceased in a short time. Any constipating or griping effect of the remedy is corrected by its combination with the above medicines. With respect to the hemlock, it may be added, that Dr. Meyer, of Kreutzburg has found tannin as obtained in infusion of galls an efficient remedy against the poisonous effect of this substance, emetics of sulphate of zinc having been previously employed to empty the stomach.

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* *Gaz. des Hôpitaux*, Dec. 8, 1842, and *Lond. and Edin. Month. Journ.*

† *Il Raccoglitore Medico.*

* *Hufeland's Journal*, Jan. 1843.

† From *The Lancet*, March 18, 1843.

COLLYRIUM OF LUGSOR.*

℞ Sulphate of zinc . } aa. 4 grammes
Sulphate of alumina }
Water . . . . . 128 grammes

M. Quadri, Professor of ophthalmology at Naples, exclusively employs this collyrium in cases of ophthalmoplennorrhœa, or of Egyptian ophthalmia.

In the second stage of ophthalmia, and when its intensity has diminished, M. Flarer, of Paris, advantageously combats the remaining inflammation and pain by turpentine taken internally, in the following form :—

℞ Essential oil of turpentine, 4 grammes
Emulsion of sweet almonds, 180 to 240 grammes.

SOLUTION OF COFFEE.*

BY WILLIAM DAVIDSON, M.D., &c.

From the experiments of Mr. Donovan, it appears that water extracts, by infusion, the same quantity of matter from coffee, in very fine powder, as by decoction. But as a fine state of powder is not to be expected in the ordinary management of culinary affairs, a decoction of coffee, ground in the usual way, will be stronger than an infusion; and more or less boiling is generally practised by economical housekeepers. Mr. Donovan recommends the following method as efficacious in preserving both the aroma and bitter quality of the coffee. The whole water to be used is divided into two parts. One part cold is to be poured upon the coffee, and merely brought to a boiling point, when, being allowed to settle a little, is to be poured off. The remaining half of the water, at a boiling temperature, is then to be poured upon the grounds, and kept boiling for about three minutes, and after a few moments' subsidence the clear part is to be poured off, and mixed with the former liquor. The object in this method is, first, to extract, by a kind of infusion, the aroma of the coffee, by bringing the liquid to the boiling point; and, second, to extract the latter properly by decoction. This plan is apparently founded on correct principle; but as most housewives would consider it troublesome to conduct the double process, the ordinary method, if carefully managed, may, in general, answer the purpose. The coffee pot should be deep, so that any portion of the aromatic principle, which is volatilised by the heat, may be condensed in the cooler part of the vessel at the top, and flow back. The boiling should be made over a slow fire, destitute of smoke, for three or four minutes; or rather it should be kept simmering for that period, and two or three grains of very finely cut isinglass, of the most soluble quality, should be added to each ounce of coffee, which will generally be found quite sufficient to clarify the liquid, without filtration, or any similar process.

Various proportions of coffee and water are used by different persons; and in eastern and continental countries it is made much stronger than in England. The proportions which Mr. Donovan recommends are at least two ounces and a half of coffee to an imperial quart of water.

APPLICATION OF WALNUT-LEAVES TO THE TREATMENT OF SCROFULOUS AFFECTIONS.*

BY DR. MAUTHNER.

The trials which have been persevered in for several months in the *Clinique Médicale* of the Hospital for Children, at Vienna, have been crowned with success, and have proved that the leaves of the walnut, administered under the forms of tincture and extract, possess a truly indisputable efficacy in the treatment of scrofulous diseases of the skin and glands.

However, Dr. Mauthner has ascertained that this means is quite powerless in scrofula of the bones; he also thinks that, in the latter case, the most certain means at present known is cod liver oil.

CHEMICAL AND TOXICOLOGICAL EXPERIMENTS RELATIVE TO PRUSSIC ACID.†

BY M. BONJEAN.

According to these experiments, animal substances distilled in the sand-bath, in water of the temperature of from 100 to 120° C., may sometimes furnish a small quantity of prussic acid combined with ammonia.

The formation of this product, like all those belonging to organic decomposition, may be modified by the circumstances in which it takes place, by the nature and mode of employing the reagents which serve to demonstrate its existence, and by the degree of putrefaction of the substances submitted to analysis. It is true that, in a great number of experiments of this kind, the author only once succeeded in obtaining, with sulphate of copper, the red coloration, and afterwards the chesnut-brown precipitate, which can be no other than cyanuret of copper.

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* *L'Experience*, No. 296, March 2, 1843.

* C. W. Hufeland's *Journal der Praktischen Heilkunde.*

† *Giornale delle Scienze Mediche.*

For all this, we cannot, in medical jurisprudence, affirm the existence of Prussic acid, if the precipitate has not been subjected to some ulterior operations allowing of the removal of the cyanogen, of the verification of the nature of this body in an irrefragable manner.

IODIDE OF POTASSIUM AND VERATRIA IN TUMEFACTION OF THE LIVER AND DROPSY.*

BY DR. WEIHE.

Dr. Weihe speaks highly of the internal employment of iodide of potassium, associated with frictions with veratria, in cases of tumefaction of the liver complicated with dropsy.

He orders friction, morning and evening, on the region of the liver, with an ointment composed of 10 parts of veratria and 15 parts of lard.

In the first frictions, the urinary secretion doubles in quantity, and this effect is maintained for a week. Then, twice the weight of veratria is used to the same weight of lard, and the treatment is continued for four weeks.

Under the influence of this treatment, the dropsy is dissipated, and by continuing the use of the iodide of potassium, the hepatic tumefaction itself finally disappears.

USE OF GASEOUS AMMONIA.†

BY ALFRED SMEE, F.R.S.

Mr. Smee recommends the direct inhalation of diluted ammoniacal gas in dryness of the throat, chronic hoarseness, especially in that which is often left as a sequela of influenza, in the relaxed, swollen, and apparently semi-œdematous state of the mucous membrane of the throat, in incipient cynanche tonsillaris, and in old-standing cases of asthma, especially in those in which the medical man considers that the internal use of the sesquicarbonate of ammonia is indispensable, in which the extremities are cold, the pulse feeble, and the general vital powers are depressed; in these cases the local application of ammonia is particularly grateful, the patient feeling a glow after its exhibition, and the warmth first imparted to the lungs extending by degrees over the whole system. The presence of inflammatory symptoms, local or general, counter-indicate its use. Ammoniacal gas is an antidote to prussic acid and bromine. Its medicinal action in the complaints above enumerated, appears to be exerted in inducing a secretion of fluid from the parts with which it comes in contact. The most convenient mode of administering it, is to use the vapor that spontaneously exhales from solutions of ammonia, no solution being used stronger than the *liquor ammoniæ* of the shops, or weaker than the same diluted with 20 or 30 times its quantity of water.

TAR-OINTMENT.*

BY DR. TURNBULL, OF WOLVERHAMTON.

Tar-ointment, says Dr. Turnbull, is a remedy which I have found of great service in several cases of diseases of the skin, which have occurred in my own practice; and I have besides seen it used with success in the removal of psoriasis, lepra, and eczema, by M. Emery, at the *Hôpital Saint Louis*. He has also, I observe, lately employed, with satisfactory results, concrete naphthaline, a preparation obtained from tar, in the treatment of psoriasis. About four years ago a case came under my care of impetigo larvalis of the scalp, in a child four years of age, where I made use of tar-ointment with very good effect, after several other means had been tried without the slightest benefit. Every part of the scalp was covered with pustules, which secreted abundance of a viscid matter, of a disagreeable smell, and the lymphatic glands at the upper part of the neck were so much swelled in consequence of the irritation from the inflamed scalp, as to cause some difficulty in breathing. After employing antiphlogistic means, purgatives, and leeches behind the ears, also emollient applications, poultices, and unguentum zinci, without the least benefit, I ventured, not without some fear of increasing the inflammation, to apply the tar-ointment considerably diluted. No irritation, however, followed, and in the course of two days the swelling of the lymphatic glands began to subside, the secretion of matter from the pustules diminished, and, within a week from the first application of the ointment, the eruption had almost entirely disappeared. Some time ago I made use of the tar-ointment in an obstinate case of prurigo, in a stout child, about three years of age. The eruption had been present from a short time after birth, it covered almost every part of the body, and had resisted every kind of treatment that had been tried. I first prescribed purgatives, with alkaline medicines, internally, and the tepid bath, with carbonate of soda dissolved in the water. As no benefit followed this treatment, the tar-ointment was rubbed on, and in a short time it removed the eruption. A relapse, however, took place soon after the remedy was laid aside, and I directed that it should be again applied, but as the child was not brought back to me I am unable to state whether the eruption was finally removed or not.

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* *Medicinische Zeitung.*

† From *The Medical Times*, April 22, 1843.

* From *The Medical Times*, April 22, 1843.

ON THE EXTERNAL USE OF ELIXIR ACIDUM HALLERI, (ACID. SULPHURICUM AROMATICUM, OR ELIXIR OF VITRIOL,) IN CASES OF NEURALGIA.*

BY DR. AD. BARACH.

This substance appears lately to have attracted some attention in Germany, as a rubefacient in a variety of painful affections, and Dr. Barach was led to essay its powers in five different cases, the particulars of which he gives.

CASE I.

A lady, aged 28, of nervous temperament, had suffered from severe pain in the right side of the head for nearly a year. The painful spot was not larger than a dollar, and the pain had hitherto been appeased by none of the means employed, excepting steady pressure applied to the part. The hair was removed from the painful spot, and the diluted elixir of vitriol was well rubbed into the place. In a fortnight the patient was completely relieved.

CASE II.

A Jewess, the victim of clavus hystericus, was recommended to try the use of the elixir of vitriol externally over the seat of the pain. After persevering in its use for a few weeks, she recovered.

CASE III.

A Jewess, aged 50, having suffered for several years from wandering rheumatic or neuralgic pains in different parts of the body, the disease appeared to concentrate itself in a point betwixt the shoulder-blades, where it attained a pitch of the greatest intensity. All the measures tried,—opium, aconite, baths, antimonials, &c. &c.,—did no good. Having come under Dr. Barach's care, he advised a trial of the elixir Halleri locally, and with such good effect, that in three weeks the patient had completely recovered.

CASE IV.

A woman, 48 years of age, had for several years suffered from gout or rheumatic swellings of the upper extremities. In March, 1842, the right shoulder-joint swelled and became so painful, that the patient was confined to her bed, suffering excessively. For a fortnight she had had no rest by night or day, and all that was tried seemed to do no good. At length the elixir vitriolicum was prescribed by Dr. Barach, and in a couple of weeks the patient had got entirely rid of her pains.

CASE V.

Here the pain, which had fixed itself in the elbow-joint, appeared to have succeeded the re-percussion of an eruption of the skin, under which the patient had long labored. The application of the elixir was crowned with the same happy result here as in the former cases.

The elixir of vitriol was generally used diluted with four times its bulk of water; it was directed to be employed as a liniment, and well rubbed into the part with the hand night and morning, so long as this could be done without exciting severe pain, which the application always produced at last. It acts as a rubefacient, producing a kind of erysipelatous redness of the parts into which it is daily rubbed.

ON LAUREL-WATER PREPARED BY DISTILLATION.*

BY DR. WAFELBAKKER.

The very general employment, as well as the universal opinion relative to the efficacy and the different modes of preparing laurel-water, determined me to renew my experiments on its preparation by steam, and to compare my products with those obtained by the method directed in the *Belgian Pharmacopœia.*

It has been ascertained that the quantity of prussic acid contained in cherry-laurel leaves, varies according to the place of production, and the season at which they are gathered, which it is generally considered should be in the month of August. As regards the place of production, I have not paid any attention to it, and I have contented myself with mixing leaves collected in all parts of the country.

For this purpose I collected, at the proper season, cherry-laurel leaves in the environs of Amsterdam, Haarlem and Naarden.

Exp. I.—All these leaves were mixed. I

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* *Oester. Med. Wochenschr.* No. 3, 1843; and *Dr. Cormack's Journal*, April, 1843.

* *Archives de Médecine Belge*, Jan. 1843.

weighed 9 kilogr.; I cut them, and steeped them for 24 hours in a small quantity of water, the leaves being only covered with it, and under a pressure of 1¼ atmosphere; the steam was driven by a conductor through and round the alembic which contained the leaves: 6 kilogr. of laurel-water were condensed. By analysis by means of nitrate of silver, ammonia and purified nitric acid, I obtained, from 30 grammes of this water, 0·324 gram. of cyanuret of silver, = 0·0650 gram. of dry prussic acid.

Exp. II.—I treated 9 kilogr. of leaves in the same manner as in the first experiment, with the exception that, before the immersion, I gently bruised them with a small portion of water, until I had obtained a soft mass.

By the mode of analysis adopted in the first experiment, I obtained 0·392 gram. of cyanuret of silver, = 0·0798 gram. of crystallised prussic acid.

Exp. III.—The same quantity of leaves and the same treatment as in the two first, but with the addition of alcohol, according to the Prussian *Pharmacopœia*.

The products obtained, treated as in the preceding experiments, gave identical results.

In order to make comparative analyses, I procured a sufficient quantity of laurel-water, carefully prepared according to the Belgian *Pharmacopœia*.

50 gram. of the latter produced 0·235 gram. of cyanuret of silver, = 0·0479 of crystallised prussic acid.

50 gram. of laurel-water, which I procured from M. A., Chemist, of Amsterdam, yielded 0·251 of cyanuret of silver, = 0·051 of prussic acid.

Some laurel-water which I obtained from M. Devry, of Rotterdam, gave still less favorable results than the preceding. I attribute this last result, partly, at least, to the quality of the leaves.

From the above processes and analyses I think I may conclude:—

1. That the laurel-water obtained by steam, gives an infinitely more powerful medicine than that prepared by the heat of the fire, and according to the method of the Belgian *Pharmacopœia*.

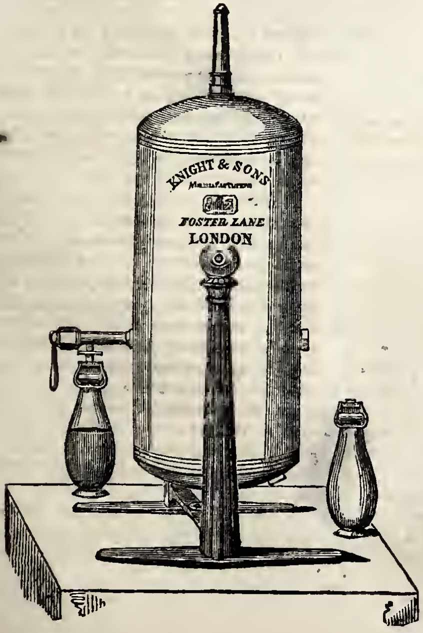
2. That, in both of these methods, it is advantageous to bruise the leaves before immersing them.

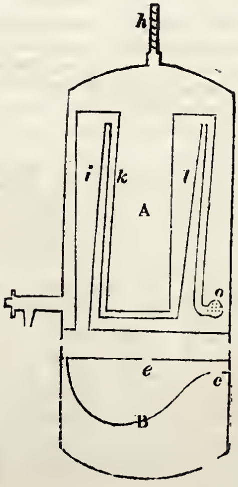
3. That the addition of alcohol, with the view of obtaining a greater quantity of prussic acid, is useless.

I thought that the above would not be useless to the medical world, and I have resolved to publish my successive experiments on the same subject.

BAKEWELL'S PORTABLE APPARATUS FOR THE PREPARATION OF AERATED WATERS.

By the kindness of Messrs. Knight and Sons we are enabled to lay before our readers a description of this very useful invention. The following diagrams give a just idea of the external and internal mechanism of the apparatus.





The annexed diagram will sufficiently explain the construction of the internal part of the machine. A B are two distinct earthenware vessels joined together, and cemented inside a strong iron cylinder; in the lower one, B, the gas is generated, and the upper one, A, contains the water or other liquid to be aërated.

The vessel B is separated by a partition into two parts; the lower one contains the carbonate of soda, and the upper dilute sulphuric acid. Through a little aperture, *c*, a small quantity of the latter flows out at every vibration of the cylinder on to the carbonate of soda, thereby generating carbonic acid gas, which passes through the hole *e*, in the top of the lower vessel, rushes up the large conical tube *i*, when it is forced down the smaller one *k*, into the second large one *l*, which acts as a second gas purifier; it is then forced down the other small tube, and issues from a number of minute holes at *o*, rising through the water contained in the vessel A. The vibration of the machine agitates the water, and occasions the gas to be absorbed almost as quickly as it is produced. A quarter of an hour is generally sufficient to complete the process. The pressure gauge *h*, indicates the number of atmospheres of gas the water contains. It will be observed, that there is no communication whatever between the lower vessel, where the gas is generated, and the upper one containing the water, excepting through the gas pipe *i*.

The advantages of this portable machine are so evident as scarcely to require enumeration. By its means, every man may make his own soda water at a cost not amounting to sixpence the gallon; no art is necessary for its management; so little labor is requisite in working it, that sufficient motion may be imparted to it with one finger. As its internal coating consists of unglazed earthenware, there is no fear of the aërated water being impregnated with any metal.

This apparatus is also applicable to the purpose of making lemonade and fluid magnesia; and as many medicines are now being associated with carbonic acid, druggists will find it very useful in a pharmaceutical point of view.

To private families, the medical profession, pharmaceutical chemists, and retailers of soda water and other aërated beverages, this machine is invaluable, and we prophesy that, in a short time, few respectable houses will be without one.

We tasted some lemonade and some soda water prepared in Bakewell's Apparatus, and we assure our readers that it is fully equal to any other which we ever met with. It will be quite a boon to those who reside at a distance from large towns, and to those who reside in hot countries. No one who can afford it, will do without such a luxury.

SUGGESTED REMEDY FOR MELANOSIS, OR "BLACK SPITTLE" OF COLLIERS.

To the Editors of The Chemist.

GENTLEMEN,—

Allow me call the attention of your medical readers to what has occurred to me might be used with advantage in the treatment of *melanosis*, or black spittle, so common among colliers. It is well known that this fatal disease, which is of the most frequent occurrence among the older colliers, and those men who have been employed in cutting and blasting stone dykes in the collieries, proceeds from carbonaceous infiltration into the lungs, proceeding from a deficiency in the supply of atmospheric air, causing difficulty of breathing, and consequently the inhalation of the carbon which the lungs throw off in expiration, and also any carbonaceous substances floating in the atmosphere. The symptoms of this disease are, emaciation of the whole body, constant shortness and quickness of breath, occasional stitches in the side, quick pulse, usually upwards of one hundred in the minute, hacking cough day and night, attended by a copious expectoration, for the most part perfectly black, and very much the same as thick blacking in color, from which the disease receives its name. It almost invariably proves fatal, in spite of the different methods which have been tried for its cure. It appears to me that the inhalation of pure oxygen or nitrous oxide at repeated intervals, which would tend to burn the carbonaceous substance which forms the deposit, might prove advantageous. Of course the experiment would require to be tried with caution by some experienced medical man, from the danger of increasing the circulation of the blood by the oxygenated air, which might aggravate instead of alleviate the symptoms.

Should you think this suggestion of any value, it is at your service;—it may at least serve to direct the attention of your readers to this fatal disease, to which so many fall victims.

I remain, Gentlemen,
Your obedient Servant,
THOMAS HODGSON.

Staffordshire, April 21, 1843.

ON THE SPECIAL FUNCTION OF THE SKIN.*

BY ROBERT WILLIS, M.D.

(*Communicated to* THE CHEMIST.)

THE purpose which is answered in the animal economy by the cutaneous exhalation has not hitherto been correctly assigned by physiologists. The author believes the essence of the function to be the elimination from the system, of a certain quantity of water, and considers the saline and other ingredients which pass off by the skin to be in too inconsiderable a quantity to deserve being taken into account. He combats the prevailing opinion that this function is specially designed to reduce or to regulate the animal temperature. It has been clearly shown, by the experiments of De la Roche and Berger, that the power which animals may possess of resisting the effects of a surrounding medium, of high temperature, is far inferior to that which has been commonly ascribed to them; for in chambers heated to 120° or 130° Fahr., the temperature of animals is soon raised 11° and even 16° Fahr. above what it had been previously, and death speedily ensues. The diminution, or even total suppression, of the cutaneous exhalation, on the other hand, is by no means necessarily followed by a rise in the temperature of the body. In general, in dropsies, which are attended with a remarkable diminution of this secretion, an icy coldness usually pervades both the body and the limbs. A great fall in the animal temperature was likewise found by Fourcault, Becquerel and Bresched, to be the effect of covering the body with a varnish impervious to perspiration; and so serious was the general disturbance of the functions, in these circumstances, that death usually ensued in the course of three or four hours.

The question will next arise, how does it happen that health, and even life, can be so immediately dependent, as we find them to be, on the elimination of a quantity of water, to the extent of some 33 ounces, from the general surface of the body in the course of the twenty-four hours? To this the author answers, that such elimination is important as securing the conditions which are necessary for the endosmotic transparence between arteries and veins of the fluids that minister to nutrition and vital endowment. It is admitted by physiologists, that the blood, while still contained within its conducting channels, is inert with reference to the body, no particle of which it can either nourish or vivify until that portion of it which has been denominated the *plasma*, has transuded from the vessels, and arrived in immediate contact with the particle that is to be nourished and vivified; but no physiologist has pointed out the efficient cause of these tendencies of the plasma, first, to transude through the walls of its efferent vessels, and, secondly, to find its way back again into the efferent conduits. The explanation given by the author is, that in consequence of the outgoing current of blood which circulates over the entire superficies of the body, perpetually losing a quantity of water, by the action of the pseudoriporous glands, the blood in the returning channels has thereby become more dense or inspissated, and is brought into the condition requisite for absorbing, by endosmosis, the fluid that is perpetually exuding from the arteries constantly kept on the stretch by the injecting force of the heart. Venous blood has, in fact, been found, by repeated experiment, to be somewhat more dense than arterial blood.

In an Appendix to the paper, the author points out a few of the practical applications of which the above-mentioned theory is susceptible. Interference with the functions of the skin, and principally through the agency of cold, he observes, is the admitted cause of the greater number of acute diseases to which mankind, in the temperate regions of the globe, are subject. He who is said to have suffered a chill, has, in fact, suffered a derangement or suppression of the secreting action of his skin; a process altogether indispensable to the continuance of life has been implicated, and disturbance of the general health follows as a necessary consequence. Animals exposed to the continued action of a hot, dry atmosphere, die from exhaustion; but when subjected to the effect of a moist atmosphere, of a temperature not higher than their own, they perish by the same cause, and that very speedily, as those which have had their body covered with an impervious glaze; in both cases, the conditions required for the access of the oxidised, and for the removal of deoxidised plasma, are wanting, and life necessarily ceases. The atmosphere of unhealthy tropical climates differs but little from a vapor-bath at a temperature between 80° and 90° Fahr.; and the dew-point in those countries, the western coast of Africa, for example, never ranges lower than three or four degrees, sometimes only a single degree, below the temperature of the air. Placed in an atmosphere so nearly saturated with water, and of such a temperature, man is on the verge of conditions that are even incompatible with his existence;—

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* *Proceedings of Royal Society*, for March 2nd and 9th.

exposure to fatigue, or to the burning sun, by which the activity of the skin is excited, whilst the product of its action cannot be taken up by the air, is then necessarily followed by disease, which experience has shown to be of the most dangerous nature. The terms *miasma* and *malaria* may, according to the author, be regarded as synonymous with air at a temperature of from 75° to 85° Fahr., and nearly saturated with moisture.

What, again, is the cause of the rapidly fatal event which occurs in some acute cases of scarlatina? The dead body of the victim of this disease gives no information on this subject. But if we regard the patient as placed by his disease in the same circumstances as he would be were his body completely covered by an impervious glaze, we obtain a key to the right understanding of the mischief, and happily, also a hint as to the proper means of relief; the function of the skin is abolished, and unless it be speedily restored, the patient will be lost. The remedy is to be sought for, not in wine and brandy, but in tartar emetic.

THE INFLUENCE OF ATMOSPHERIC AIR ON PUS.*

It is a fact now well established, that if pus be exposed to the contact of the air, it soon acquires properties which render it strikingly deleterious, when it is conveyed into the torrent of the circulation, either by natural absorption or by direct injection into the veins. Healthy, or what used to be called *laudable*, pus may be injected into the veins of an animal without danger, provided the quantity be small; if too much be forced in, the pulmonary circulation seems to become mechanically obstructed, and the animal dies asphyxiated. When, however, purulent matter, that has become vitiated from exposure to the air, is introduced, a veritable infectious (we believe that the author means by this term rather *cachectic* than *contagious*) disease of the whole system is induced: the animal almost invariably dies; and, on dissection, the principal viscera are found to be the seat of the purulent deposits, or what have been called *metastatic abscesses.*

M. Bonnet, chief surgeon of the Hôtel Dieu, at Lyons, published a Memoir in 1837, to prove that the symptoms of putridity, which are observed after injuries when the wound will not cicatrise, are owing to the absorption of sulphuretted hydrogen from the pus-discharging surface. No one can doubt that this gas is evolved, whenever animal matter becomes decomposed; and we daily witness its effects on the plaster used in strapping wounds; for this becomes black and discolored in consequence of the action of the gas on the lead in its composition. There is, however, no good reason to believe that the small quantity of gas that can be absorbed in the manner supposed by M. Bonnet, is the cause of the alarming constitutional symptoms which not unfrequently supervene from the action of the atmospheric air on collections of purulent matter.

Other physiologists have suggested that another deleterious agent, hydrocyanic acid, may be generated during the process of suppuration; and they have supposed that the blue discoloration which is not unfrequently noticed on the dressings of some sores, is owing to the presence of a cyanuret of iron in the discharge; but the recent experiments of Dr. Conté are certainly not favorable to this idea.

The cause of the fœtor of an unhealthy pus has long been a puzzle to the medical inquirer. To say that it is due to a vital agency, is leaving the difficulty quite unexplained. Every one is now aware that purulent matter becomes changed at the expense, so to speak, of the constituents of the air; but, hitherto, not many experiments have been made to determine exactly the relations between the two. From the researches of Dr. Conté it seems to be clearly made out that the heat of the human body very decidedly promotes the decomposition of pus; for he found that it may be kept unchanged in a vessel for a much longer time than usual, if the temperature be low. (Perhaps a useful hint in the treatment of unhealthy abscesses may be derived from this circumstance; instead of using poultices and other warm applications, it may often be well to have recourse to cold lotions, &c.)

There is a certain local change in an ulcer itself, which deserves more attention than it has hitherto received from surgeons—we allude to the inflammation of its surface and the destruction of the cicatrising membrane by the ammonia, which is apt to be generated under the dressings, and which is then kept confined by the strips of diachylon plaster that have been applied.

THERAPEUTIC SUGGESTION.

Since the atmosphere may be so very injurious under some circumstances where organic products lodge in the tissues of the animal body, it might be well that surgeons would imitate the example of chemists in reference to certain substances, by keeping carefully protected from the agency of the disorganising element, the atmospheric air, parts that are inflamed and the products that are secreted from them. Surgeons have differed a good deal among themselves as to the best mode of opening many abscesses. Of late much attention has been drawn to this subject by the ingenious and very useful suggestions of M. Guérin, in the department of what has been called "Subcutaneous Surgery." No one can doubt but this mode of exploring certain purulent collections is far more safe than that of making a direct incision into them. It is unnecessary, however, to pursue this subject further at the present moment.

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* From the *Medico-chirurgical Review*, April, 1843.

TWO CASES OF POISONING BY LEAD, IN MACCUBA SNUFF.*

BY PROFESSOR OTTO.

Two cases of poisoning, probably by Maccuba snuff containing red lead, have excited universal attention in Copenhagen. In the spring of 1842, M. Dreyer, highly esteemed as a scholar and botanist, died there after four months' illness, the symptoms having been doubtful, and their cause difficult to ascertain.

The deceased was much lamented, but his death had been almost forgotten, when his friend Dr. Bramsen read in a journal that red Maccuba snuff was sometimes adulterated with red lead. On this, he imagined that his deceased friend, who took a great deal of snuff, might have been poisoned by it. He therefore bought some at the shop where the deceased used to buy his, and found that it was mixed with a number of large and small grains, which looked like minium; and, on chemical examination, he discovered that the snuff contained from 16 to 20 per cent. of lead.

After this discovery, Dr. Ahrensen, the physician of the deceased, did not doubt that Dreyer had been killed by the lead contained in the snuff; and this opinion seems fully confirmed by the course of the symptoms.

The patient, who was always rather pale, but who had almost always been well, with the exception of some unimportant chest symptoms, fell ill in the autumn of 1841. He had the common symptoms of dyspepsia, with costiveness and muddy complexion. As he lived a sedentary life, and devoted himself with great diligence to scientific pursuits, exercise was advised, and bitter and laxative pills were prescribed.

After this, he felt a little better, when, a few days before Christmas, he was suddenly attacked by violent colicky pains, which made him scream loudly, and throw himself from one side of the bed to the other. The pulse was natural, the tongue clean, the abdomen normal on percussion, and not painful on pressure. The bowels had been open the day before. The laxatives which had been prescribed were omitted; but some clysters containing a grain of opium, diminished the attacks, and at last removed them entirely. The course of the symptoms, the effect of the remedies, and the absence of all indications of disease in the viscera of the abdomen, excited, even then, suspicion of lead colic; and it occurred to Dr. Ahrensen that the red wine which he had recommended the patient, and which was very cheap, might possibly contain lead; but the examination of the wine, as well as the vessels in which the patient's food was prepared, gave only negative results.

His improvement was of short duration; evacuations from the bowels were extremely rare, and when there had been none for a couple of days, from the omission of the medicines, the colicky pains returned, combined with cardialgia, and sometimes so violently, that the patient seemed to be in the greatest danger. He had four of these attacks during the winter, which were removed, partly by cathartics, partly by opiates. In one paroxysm alone, the pulse was rather quick, and somewhat tense, and the abdomen tender on pressure; so that Dr. Ahrensen, to face the possibility of an inflammatory complication, bled once, and added calomel to the opium. As he could not discover any other cause for the symptoms, he supposed that a stricture of the colon existed, as well as a dilatation above it; a supposition which was confirmed by the evacuation of a large mass of round hard fæces during the last attack, after which the patient felt pretty well. Though he had become very thin, and his complexion was still dull and yellowish, he now began to attend to his business; but, a week afterwards, he was suddenly attacked by violent headache, which he ascribed to catching cold. Dover's powder, and elder tea in the evening, relieved him on the following day, but in the afternoon the attack returned with increased vehemence, and, as the pulse at the same time decreased in frequency, and he fell into a comatose state, it could no longer be doubted that the brain was attacked. After being fruitlessly treated with leeches, blisters, and strong purgatives (croton oil), he was taken to the hospital, where the symptoms remained unchanged, and were terminated by death two days after his admission, and about four months after the first attack of colic.

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* *Zeitschrift für die gesammte Medicin*, March, 1843; and *Medical Gazette*, April 21, 1843.

On dissection, nothing abnormal was found in the abdomen, excepting a trifling enlargement of the colon, probably caused by the frequent clysters; the brain, too, was healthy, except a slight injection of the membranes.

The striking resemblance of the first symptoms of the disease to lead colic, the agreement of the cerebral symptoms with those which occur in the comatose form of the *Encephalopathia saturnina* described by Tanquerel de Planches, the negative results of the dissection, and the patient's almost constant complaints of colicky pains, which were present during the whole course of the disease, make it highly probable that the fatal event was caused by the adulteration of the snuff with red lead.

These circumstances have made the case of another patient, a young physician, who is still alive, very conspicuous. He has suffered for a year, from an affection of the abdomen, characterised by colicky pains and obstinate costiveness, during which he has become extraordinarily thin. This patient is also a great snuff-taker, and long used the same snuff as the deceased patient. As he has now left it off, it is to be hoped that his malady will be cured.

The tobacconist has been cited to answer to his misdemeanor.

SPASMODIC CHOLERA.*

BY T. W. WANSBROUGH, ESQ.

I AM at all times unwilling to intrude my personal sufferings upon the notice of the profession, yet I am led to imagine that the following case of Asiatic cholera may not prove uninteresting, inasmuch as I think it presents some useful information to, at least, my junior brethren, in the treatment of that horrible disease.

In August last, which was a hot one, I travelled during four days through Kent, in an open chaise. Arriving at Margate on the 19th, and enjoying excellent health, I took two tepid shower-baths, daily, after breakfast, carefully avoiding fruits and vegetables. In the plenitude of health, strength and spirits, on the 26th, I got by exercise into a profuse perspiration, and, by way of refreshment, *credat Judæus!* drank a glass of cold ginger beer! which I afterwards qualified with hot brandy and water.

I went to bed at twelve o'clock, but was shortly afterwards seized with pain in the bowels, followed by a copious bilious motion. I went to sleep, and at two o'clock was awakened by a similar cause, and again relieved. I again fell asleep, and slept four hours. At six o'clock I was aroused by a return of the pain, followed by a *quart*, at least, of "rice-water" motion. In less than ten minutes, another; each motion preceded by copious vomiting; when I summoned the man of the house to procure medical assistance. Mr. Hoffmann, jun., who fortunately resided close by, attended immediately, and to his judgment and skill, under Providence, I feel that I am indebted for my life. In an instant he saw the nature of the case, with all its impending danger. He promptly returned with pills, which contained each a quarter of a grain of opium, one of calomel, and two of acetate of lead. I took four, but almost immediately rejected them. I swallowed four more, and repeated the dose every hour, until twenty-four were taken. The vomiting and diarrhœa were checked, and did not return. I verily believe that another such motion as the last would have been fatal. Then came the horrible spasms, which must be felt to be appreciated. To relieve them Mr. H. gave me two doses of calomel, of six grains each, in two hours, so that in six hours I took *six grains of opium, thirty-six of calomel, and forty-eight of acetate of lead!* To this I attribute my preservation. My thirst was insatiable, as may be supposed. I would have given the world for a draught of cold water, but that was expressly prohibited. I was allowed to moisten my parched mouth with a small effervescent draught occasionally. In less than an hour after Mr. H.'s first visit, I perceived that my nails and fingers were blue, and a profuse cold sweat covered the body and extremities.

I remained in a state nearly approaching to collapse from ten o'clock on Saturday, the 27th, until Monday morning, when I perceived that I was perfectly jaundiced. Brandy and arrow-root were as freely administered as I was able to take them. Mr. H. continued his attendance until the 6th of September, when I returned home quite convalescent; and I am now perfectly well, and have been so for the last three months.

Mr. Hoffmann informed me that he was led to the adoption of his treatment of cholera, from the effects of lead upon plumbers, and those engaged in the manufacture of the acetate, viz., colica pictonum; and, by adopting the converse of the proposition, he has succeeded in saving many lives, mine among the number. I should state that, with the view of supplying the loss of the serum and salts of the blood, Mr. H. prescribed, as an auxiliary, the "saline treatment;" but I could not retain the mixture, and as it threatened serious consequences, he abandoned it. I took but one rhubarb draught (on Monday), which acted once. The fæces were black, but became gradually tinged with healthy bile, until my recovery. I suffered severely from ptyalism. My gums were dreadfully swollen and painful, but I soon got over that. It is a remarkable fact, yet, extra-medical as it may appear, I will risk the mention of it here, that, driven almost to desperation by a paroxysm of pain in my gums, I smoked a cigar, and was instantly relieved. As the remedy was not unpleasant, I continued it "until cured."

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* From *The Lancet*, April 22, 1843.

IV. REVIEWS AND NOTICES OF BOOKS.

TRAITÉ DE CHIMIE APPLIQUÉE AUX ARTS. By M. Dumas. Vol. VI. 1843. Paris: Bichet Jeune.

After a lapse of several years, M. Dumas has at length ushered into the world the sixth volume of his most excellent treatise on Chemistry applied to the Arts. So long had its publication been delayed, that we had ceased to expect it, and its appearance was a most agreeable surprise to us.

So great has been the sale of this work, that it is a matter of great difficulty, if not of impossibility, to obtain the first five volumes. It is by far the best work on the subject in any language, that has met our eyes.

We regret that the late period of the month at which this notice is written prevents us from making a complete analysis of this volume. We shall, however, content ourselves with giving a brief abstract of its contents, and shall endeavor occasionally to lay before our readers some interesting translations from it.

The volume before us is divided into eight Chapters.

Chapter I. treats of cellulose, ligneous incrustations, the bleaching of linen, the manufacture of paper, the preservation of wood, and ulmic acid.

Chapter II. is devoted to the feculas, diastase, the manufacture of starch, the manufacture of fecula, dextrin, and inulin.

Chapter III. is occupied with the sugars, sugar-refining, glucose, glucic acid, sulphoglucic acid, melasic acid, caramelic acid, and lactose, or sugar of milk.

Chapter IV. treats of mannite, gums, and mucilages.

Chapter V. is devoted to the very important subject of fermentations; namely, alcoholic, saccharine or glucosic, lactic, viscous, and acid fermentations; hydruret of acetyl (aldehyd); benzoïc, sinapisic, pectic, gallic fermentations, fermentation of fatty bodies, digestive, ammoniacal, nitrous, caseous, and putrid fermentations.

Chapter VI. is occupied with farinas, grinding, vermicelli and pastes; fabrication of bread, manufacture of beer, cider, perry, wines; manufacture of brandy; vinegar, ceruse.

Chapter VII. treats of the neutral fatty bodies, steäric, margaric, oleïc, pimelic, adipic, azoleïc, lipic, and elaïdic acids; glycerine, steärine, margarine, oleïn, fabrication of the vegetable fat oils, purification of seed oils, non-siccative seed oils, siccative oils, olive, castor, and croton oils; solid oils, butter of coco, laurine, butter of cacao, anamirtine, animal fats, tallow, steärine taper, animal butter, wax, cholesterine, ambreïn, and castorin.

Chapter VIII. is exclusively devoted to the subject of soap-making.

We regret being unable to give an extract on the present occasion, but we shall take an early opportunity of doing so. In the meantime, we recommend such of our readers as are masters of the French language, to obtain and peruse it for themselves.

We had almost forgotten to mention that this volume is accompanied by an atlas of excellent plates.

WHAT TO DO IN CASES OF POISONING AND OF ACCIDENTS. By Professor Orfila. Translated by James Rennie, A.M. London: Sherwood, Gilbert, and Piper, Paternoster Row. Second Edition.

A valuable chart, which has been for some years before the public, and which should be possessed by every medical practitioner and chemist; no family should be without it.

As the directions given in this chart are of the most simple and comprehensible nature, and within the reach of all degrees of capacity, it is our firm opinion that if a copy of it were to be found in every house, we should hear of fewer deaths by poisoning and accidents.

This edition is considerably improved.

THE BRITISH QUARTERLY JOURNAL OF DENTAL SURGERY. Edited by J. Robinson, Esq. No. I. London: John Churchill, Princes Street, Soho.

We are amongst those who consider the subdivision of the Healing Art to be highly beneficial, both as regards the scientific advance of each particular branch, and the attainment of manual dexterity and efficiency in the operative procedures involved in their practice. The truth of this opinion is forcibly illustrated by the progress lately made in that department of Surgery, to which this publication (the first No. of which has just been issued) is especially devoted. A very few years has seen the *bar-ber-ous* tooth-drawer of St. Martin's Lane converted into the scientific dentist of the West End. The art is, however, yet in its infancy, retarded not so much by the empirical announcements and practice of some of its professors, as the want of knowledge in the public mind respecting its true principles. To supply this deficiency, and thus to elevate the dentist's art to its true grade in the estimation of the community, is evidently the object of the proprietors of the *British Journal of Dental Surgery*; and well do they merit that hearty support which their novel and highly interesting Journal will receive.

As regards the work itself, it is well printed, handsomely and liberally illustrated, and contains several excellent papers of great importance, evidently written by men of high standing in their profession; much practical and scientific information is to be gleaned from a perusal of its contents, as well to the public as to practitioners, to whom it will afford a facility for interchange of ideas and communication of practical facts, which they have not heretofore possessed, and which alone must render the future Numbers of surpassing value.

TO CORRESPONDENTS.

"Philanthropos" will hear from us by letter.

"W. T." is thanked for his suggestion, but we are not in a situation to act on it at present, as numerous engagements interfere.

"A Subscriber from the Commencement."—We do not know, but will inquire.

"E. C. M."—By the addition of an alkaline carbonate to muriate of lime.

"M. P. S."—We are glad to find that we have opened your eyes. We have not room for your letter, having already inserted two of similar purport.

"A. P. S." will receive a private letter from us, according to his request. We are at all times happy to advise our correspondents.

"An Apprentice" is not under the necessity of becoming a member of the Pharmaceutical Society. They have no power to hinder him from commencing business after the expiration of his apprenticeship.

"Junius" is quite mistaken in supposing that the wholesale druggists are bound to the Pharmaceutical Society; they are for the most part very independent men, and would scorn its trammels.

"H."—The parties alluded to richly deserve exposure; you must not expect pure articles from them.

"Medicus."—We have been compelled to omit your reply to "Virtutas," but it shall be inserted in our next.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN MARCH, 1843.

BY E. THOMPSON.

BAROMETER.

Monthly mean	29·73
Mean at 9 A.M.	29·72
Mean at 3 P.M.	29·72
Mean at 9 P.M.	29·76
Maximum on 8th	30·26
Minimum on 31st	29·20
Range	1·06

THERMOMETER.

Monthly mean	43°
Mean of maxima	48
Mean of minima	37
Maximum on 30th	59
Minimum on 1st	29
Range	30

WIND.

	Days.		Days.
N.	0	S.	2
N.E.	1	S.W.	2
E.	6	W.	12
S.E.	5	N.W.	3

RAIN.

1·56 inches.

WEATHER.

	Days.		Days.
Clear	5	Lunar halo	0
Cloudy	6	Hoar frost	5
Overcast	4	Mist	3
Showers	11	Hail	0
Continued rain	2	Lightning	1
Snow	1	Thunder	1
Frost	0	Aurora borealis	1

GENERAL REMARKS.

The barometer during this month has not approached either extreme. The temperature of the air has been low, especially at the latter end of the month, with an East wind. The quantity of rain fallen has been small.

The Rubeola, which prevailed during the last and preceding months, has disappeared, though some of its consequences still remain. Diarrhœa has frequently occurred.

Nota Bene.—*All Communications and Books for Review must be addressed "To the Editors of the Chemist, Care of Mr. Hastings, Publisher,* 13, *Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

MEMOIR ON HYPOCHLOROUS ACID; WITH SOME OBSERVATIONS ON THE SAME BODIES CONSIDERED IN THE AMORPHOUS AND CRYSTALLINE STATES.*

BY M. J. PELOUZE.

In repeating some of the principal experiments which M. Gay-Lussac has made known in his Memoir "*On the Combinations of Chlorine with Bases*," (for which *see* THE CHEMIST, Vol. III. pp. 294, 336, 374), I have observed that the action of chlorine on red oxide of mercury, is not uniform, and that it is considerably modified by the mode in which that oxide is prepared. I have endeavored to account for this circumstance, which appeared to me singular, and it is thus that I have been led to occupy myself with the work which I now have the honor of presenting to the Academy.

Oxide of mercury prepared by decomposing with an excess of potassa the nitrate or the bichloride of mercury, washed and dried at the ordinary temperature, projected into a flask completely filled with dry chlorine, gives rise to a vivid disengagement of heat and light. Numerous crystals of bichloride of mercury fill the capacity of the flask and are very soon condensed on its sides. The greenish-yellow color of the gas disappears; it gives place to a pure but faint orange-yellow color. If the cooled vessel be opened in water, it rushes into it, and occupies the chief portion of it; but an insoluble residue, consisting of free oxygen, is constantly observed. The volume of the latter gas varies with the quantity of chlorine operated on, with the temperature, and with the state of division of the oxide. If, instead of putting the oxide of mercury in contact with the chlorine, at the ordinary temperature, this gas be previously cooled by plunging the flask which contains it into a refrigerant mixture, the light, which is the sign of energetic chemical action, ceases to show itself, the temperature of the mixture rises but little, and almost all the chlorine is converted into hypochlorous acid. The proportion of oxygen eliminated is very trifling, sometimes none at all.

If chlorine be rapidly driven into a tube filled with oxide of mercury, the result is the same as in the first experiment. The tube is much heated, and the gas which passes out of it is almost pure oxygen. On the contrary, by slowly driving the chlorine against the column of oxide, hypochlorous acid is formed.

Finally, when the tube is surrounded with ice, however rapid the current of chlorine which passes through it, hypochlorous acid is still produced.

In a word, the only gaseous product which results from the action of chlorine on oxide of mercury is hypochlorous acid, when the operation is performed in such a manner that no elevation of temperature can take place.

After a certain lapse of time, the oxide of mercury which is still incompletely decomposed, and whose temperature is considerably raised by its contact with a rapid current of chlorine, acquires the property of giving almost pure hypochlorous acid by the subsequent action of this gas.

This result suggested to me the idea of immediately employing in the preparation of hypochlorous acid the oxide of mercury obtained by precipitation, and calcined at a temperature of 300° or 400° C. Indeed, such oxide, introduced into a flask filled with chlorine, gives rise to a gas of a pure orange-yellow color, which is very pure hypochlorous acid. The action is less rapid than with the oxide dried at a low temperature; it requires some minutes to entirely accomplish it. The water in which the flask is uncorked, rushes into it and fills it without any perceptible residue.

On the other hand, as might be expected, if chlorine be passed through a tube filled with the same oxide, pure hypochlorous acid is still obtained, or only mixed with chlorine, when the current of this gas has been too rapid.

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* *Comptes Rendus*, No. 2, Jan. 9, 1843.

It may be conceived how important are the above-mentioned results in the preparation of hypochlorous acid.

The process for obtaining this acid, which M. Balard has published, is very complicated and difficult of execution. It has been very beneficially simplified by M. Gay-Lussac, who has proposed to prepare dry hypochlorous acid gas directly with chlorine and oxide of mercury, in the absence of all moisture. This means perfectly succeeds when the oxide has been previously calcined: but a volume of chlorine, in re-acting, in a close vessel, on oxide of mercury, can produce only half of its own volume of hypochlorous acid gas, these two gases being supposed at the same temperature. This fact, so important for the history of hypochlorous acid, has been put beyond doubt by several very curious experiments made in this respect by M. Gay-Lussac himself. It follows, therefore, that as soon as the flask, in which the hypochlorous acid has been prepared, is opened, this gas is mixed with its own volume of atmospheric air.

Independently of this principal cause of impurity, the gas is in contact with chloride and oxide of mercury, or with oxychloride of that metal.

All these inconveniences will be avoided by preparing it in the same manner as other gases soluble in water, and decomposable by mercury. The following is the process which I propose for that purpose:—

Chlorine is driven, bubble by bubble, into a flask of water in order to wash it, and thence into two tubes, the first of which is filled with chloride of calcium to dry it, and the other with binoxide of mercury, precipitated and calcined at a temperature near that at which it decomposes. The latter tube is soldered to another of narrower bore, whose extremity dips into the flask which it is desired to fill with hypochlorous acid. The air is expelled from it by the latter gas.

I have tried to liquefy hypochlorous acid gas, and I effected it by submitting it to a cold of —20° C, under the ordinary atmospheric pressure. For this it is sufficient that the tube into which the hypochlorous acid passes should dip into a small glass matrass, with a long neck, surrounded by a mixture of ice and salt. In one or two hours, several grammes of liquid hypochlorous acid may easily be obtained.

The following are the properties of this body:—

Its color is red, and quite similar to that of arterial blood; its odor resembles those of chlorine and iodine, but it is stronger, more penetrating, and it more painfully affects the eyes. It enters into ebullition between 19° and 20° below zero. Its vapor is of a reddish yellow, which it is impossible to confound with the vapor of chlorine, especially when these two gases are compared.

It provokes coughing, and spitting of blood; and it acts, without doubt, as a very violent poison, even in very small doses.

Hypochlorous acid is denser than water; it remains at the bottom of that liquid, in which it gradually dissolves, communicating to it an orange-yellow color.

Arsenic, phosphorus and potassium burn with flame and often with violent explosion, when thrown into liquid or gaseous hypochlorous acid.

Antimony in powder acts in the same manner; but when it is employed in a not very divided state, for example, in small shining pieces of the size of a pin's head, liquid hypochlorous acid may be distilled over this metal without any alteration of these two bodies being remarked.

When we reflect, on the one hand, on the excessive instability of hypochlorous acid, and, on the other hand, on the violent action exerted on it by powdered antimony, it appears to me that we cannot but compare the above phenomena with those presented by spongy platinum and the same metal fused, in their contact with a mixture of hydrogen and oxygen. It would suffice, in this hypothesis, to pulverise antimony, to bring it to a state corresponding to that of spongy platinum.

Hypochlorous acid detonates under the influence of a gentle heat, but sometimes its elements separate slowly and without noise.

A remarkable thing is that the vibrations caused by a single stroke of the file on a tube, at the bottom of which a few drops of hypochlorous acid have been condensed, are sufficient to cause this acid to detonate, even at a temperature of —20° C. It is also very dangerous to pour it from one vessel into another.

I at first thought that the red liquid of which I have been speaking was a compound of one equivalent of chlorine with two equivalents of oxygen; but, in the first place, the mode of preparation which I followed to obtain it, and, in the second place, the products of its decomposition by heat, which consist of two volumes of chlorine to one volume of oxygen, and the comparative examination of the properties of the aqueous solution, with that prepared by the process of M. Gay-Lussac and M. Balard, left me in no doubt as to the identity of this liquid with hypochlorous acid; only this acid was hitherto known only in the gaseous state, and the preceding experiments show that it can be liquefied, at the ordinary pressure, by a cold of some degrees below zero C.

I have already said that hypochlorous acid is really colored, whether in the gaseous or liquid state, or in more or less concentrated aqueous solution.

This is demonstrated by the following facts:—

Hypochlorous acid liquefied by cold, put in contact with water, at a low temperature, is gradually dissolved in it, retaining to the end its orange-yellow color. These fractioned solutions all present an orange-yellow color.

The water in which the hypochlorous acid gas is directly received does not appear to be colored in the commencement of the operation, but its tint becomes deeper as the solution progresses; and that happens, whatever care may be taken to preserve uniformity in all the conditions of the experiment.

This solution, agitated with binoxide of mercury, is not decolored, which would appear to indicate that no free chlorine is present, for the latter would act on the oxide, and give rise to a fresh quantity of hypochlorous acid.

When oxide of mercury is mixed with water at 2° or 3° C., holding in suspension a great quantity of crystals of hydrate of chlorine, the latter disappear, producing hypochlorous acid, and the liquor left for a few moments to itself in order to separate it from the excess of oxide, presents a deep yellow tint. I have in this manner several times obtained a colored liquor which did not contain more than eight or ten times its volume of hypochlorous acid. The low temperature at which this experiment was made does not seem to authorise the explanation which would consist in referring the coloration of the liquor to free chlorine.

The chlorine which is passed into cold water holding in suspension oxide of mercury, likewise gives a colored solution of hypochlorous acid.

Concentrated solutions of hypochlorous acid, submitted to the action of a gentle heat, disengage a reddish yellow gas.

All the above facts appear to me capable of being easily explained, and in the following manner:—

Hypochlorous acid is a gas of a reddish yellow color. This color is proper to it; it preserves it so long as it is gaseous and free from water: it is rendered deeper by liquefaction.

This acid forms with water a hydrate of an incomparably less intense orange-yellow color than that of the gas, so that when the solution is slightly charged, it does not appear perceptibly colored,* although in reality it is always so. Thus, water which contains several times its volume of hypochlorous acid, appears almost colorless when looked at in an ordinary glass; but if it be introduced into a narrow glass tube of 2 or 3 decimetres in length, it will be found to have a very distinct yellow tint; and this occurs just as well with the aqueous solution of the hypochlorous acid prepared by the process of M. Balard or M. Gay-Lussac, as with that made with the liquid acid.

It seems to me, therefore, that hypochlorous acid, like the other gases formed by the combination of chlorine with oxygen, is really colored, and if it did not appear such to M. Gay-Lussac, it is probably owing to his having studied only weak solutions. These solutions, indeed, appear very perceptibly colored, only when they are charged with a very considerable quantity of gas; and as regards this latter, under the pressure of $0^{m}\cdot38$, at which M. Gay-Lussac had obtained it, it likewise appears clearly colored, only when a very great volume is regarded.

Hypochlorous acid is much more soluble in water than had been supposed. The latter dissolves, at zero, at least 200 times its volume. Indeed, 1 cubic centimetre of this solution destroyed 400 cubic centimetres of normal arsenious liquor. The chlorine and the oxygen having an exactly equal decoloring power in hypochlorous acid, as M. Gay-Lussac has demonstrated, and the formula Cl O, representing 2 volumes of this gas, it follows that water dissolves 200 times its volume of it. In other terms, 1 volume of this solution decolors as much as 400 volumes of chlorine. It marks, consequently, 40,000 chlorometric degrees.

The density of hypochlorous gas being 2·977, 1 litre of this gas, at zero and at $0^{m}\cdot760$, weighs $3^{gr}\cdot864$: 100 parts of water should therefore dissolve 77·364 of hypochlorous acid, or more than three fourths of its weight. These proportions nearly correspond to 1 eq. of acid and 6 eq. of water.

The aqueous solution of hypochlorous acid has been carefully examined by M. Balard; but he had not obtained it in nearly so high a degree of concentration: I will point out some of its properties.

Its color is yellow, like that of a concentrated solution of chloride of gold; its odor is penetrating and insupportable: it is the same as that of the decoloring chlorides, except in its intensity, which is much greater. It has a very caustic action on the skin, which it rapidly disorganises and destroys, producing violent pain and a deep wound, which cicatrises only with difficulty.

Antimony rapidly decomposes it; arsenic inflames in it, producing in the midst of the liquid a beautiful blue color. Hydrochloric acid, ammonia and oxalic acid produce in it brisk effervescence: arsenious acid acidifies in it, giving rise to slight detonations.

It causes the sulphuret of lead immediately to pass to the state of sulphate, and this property is so powerful, that it exists to a high degree in a solution diluted with 200 times its volume of water. It may be turned to account for bleaching wainscots and pictures, on the surface of which ceruse has been blackened by sulphurous emanations.

The aqueous solution of hypochlorous acid produces in the salts of protoxide of manganese, a black, velvety, precipitate of pure hydrated peroxide of manganese.

In the salts of lead, it forms a precipitate of puce oxide.

Hypochlorous acid may easily be turned to account for obtaining the two preceding oxides in a state of division, which renders them proper for some particular reactions. Of the different salts of lead, that which appears best fitted for the preparation of puce oxide, is the tribasic acetate dissolved in a large quantity of the water.

As M. Balard observed, hypochlorous acid may be placed beside oxygenous water, from the facility with which its elements disassociate under the influence of certain bodies, which besides neither yield to it nor take from it anything. Thus it is that the chloride of silver rapidly decomposes its aqueous solution.

The easy decomposition of this acid by hydrochloric acid furnishes an excellent means of procuring in abundance crystals of hydrate of chlorine. It is sufficient to cool to + 2° C. or 3° C. a solution of hypochlorous acid, and pour into it, drop by drop, hydrochloric acid. The chlorine eliminated unites with the water, and there results from it so large a quantity of crystals, that the liquid is almost entirely solidified.

I have pointed out the conditions to be fulfilled to obtain an oxide proper for the preparation of hypochlorous acid. I shall now show how different are the results of the action of chlorine on this oxide, when it is prepared by the calcination of the nitrate or by the direct oxidation of mercury.

The oxide which proceeds from these modes of preparation has a deeper orange color than that of the oxide obtained by the humid way. It is crystallised in more or less voluminous bracteæ, or in microscopic needles, glittering in the sun's light. When this oxide is submitted to the action of chlorine, in conditions similar to those which I have just indicated for the precipitated oxide, no sensible elevation of temperature is observed; the production of hypochlorous acid is so inconsiderable, that I for a long time thought none at all was formed, and it is only after a contact of several hours that it is possible to detect it. This inertness exists as well with the microscopic crystals as with the voluminous lamellæ. If, by long trituration, this oxide be reduced to an impalpable powder, it will give rather more hypochlorous acid; but, compared with the proportions furnished by precipitated oxide of mercury, these quantities are still infinitely small.

What can be the cause of these differences, which cease to exist in water, whatever may have been the mode of preparing the oxide of mercury? I know not; but I am led to believe that they may be due to two different physical states of this oxide.

The amorphous oxide alone would be susceptible of being decomposed by chlorine at the ordinary or a low temperature; the crystallised oxide would resist in the same circumstances. What leads me to give this opinion is, that the tribasic sulphate of mercury obtained by the prolonged action of boiling water on the neutral sulphate, although prepared by the humid way and dried at a low temperature, does not give hypochlorous acid when put in contact with chlorine, or rather it gives it with extreme slowness and in small quantities, like the oxide of mercury in crystals. Such at least is the manner in which a sample of this mercurial subsalt acted, whose structure appeared crystalline.

The objection which consists in the fact that the crystallised oxide of mercury, and especially its powder, gives with chlorine a small quantity of hypochlorous acid, does not seem to me sufficient to warrant the rejection of the preceding hypothesis, for this oxide might contain the amorphous modification. I doubt that the chemists who may repeat my experiments may attribute the differences which I have observed to a purely mechanical cause, as a greater number of reacting surfaces in the amorphous oxide. For my part, I should rather believe that pulverisation changes the nature of these surfaces, or sets at liberty small quantities of amorphous oxide concealed in the interior of the crystals.

Be this explanation as it may, I wished to see whether amorphous oxide of mercury and the same oxide crystallised would act in the same manner under the influence of heat.

Recollecting that Wöhler had found considerable differences in the fusing points of the same compounds, according as they were amorphous or crystallised, it appeared to me *a priori* possible that something similar might be manifested in the terms of the decomposition of oxide of mercury. Indeed, the amorphous oxide on which chlorine exerts an energetic action is decomposed long before the crystallised oxide. The difference is such that if these two oxides be placed in the same alloy-bath, or, more conveniently, in the muffle of a cupel furnace, at a properly maintained temperature, the amorphous oxide completely disappears, while the other scarcely begins to decompose.

Thus it is certain that the same compound, solely because it is amorphous or crystallised, ceases to manifest the same reactions on other bodies, and that it likewise presents great differences in the term of its decomposition by heat. That is the most active, if I may so express myself, in its reactions, which is soonest decomposed, and that is not peculiar to oxide of mercury. I have recognised the same property in the amorphous and crystallised binoxide of manganese, and in Iceland spar. The amorphous compound is decomposed before the same compound in crystals.

I hope that the experiments which I have detailed in this Memoir are of a nature to attract the attention of chemists. They prove how important it is to establish a distinction, even in a purely chemical point of view, between bodies which differ only by a peculiar state of aggregation. It was known, indeed, that certain insoluble bodies obtained by precipitation were more adapted for certain reactions than the same bodies prepared by the dry way; but the differences of cohesion alone were seen, and they were not considered also to extensively modify the chemical properties.

SOLUBILITY OF CHLORINE IN WATER.

The measure of this solubility presents some interest on account of the frequent use of the aqueous solution of chlorine. It appears, moreover, to have been determined with little care, if we may judge from the very varying numbers used to represent it in chemical books.

This solubility may be determined with sufficient precision with the normal arsenious liquor, the use of which Gay-Lussac first proposed for the determination of the strength of the decoloring chlorides of commerce. By pursuing this method, I arrived at the following results:*—

Volumes of Water.	Volumes of Chlorine dissolved.	Temperature.	
100	175 to 180	0°	
100	270 ,, 275	+9	
100	270 ,, 275	10	(Centigrade.)
100	250 ,, 260	12	
100	250 ,, 260	14	
100	245 ,, 250	14	
100	200 ,, 210	30	
100	155 ,, 160	40	
100	115 ,, 120	50	
100	60 ,, 65	70	

The maximum of solubility is therefore towards 9° to 10° C. above zero; that is precisely the temperature at which the crystals of hydrate of chlorine cease to be formed in water, or completely disappear in that liquid.

The water in which the chlorine is received dissolves a smaller proportion as this term is receded from.

Water well saturated with chlorine between 8° and 10° C. is deeply colored of a greenish yellow; if it be carried to zero, it deposits numerous flocks of hydrate of chlorine, and the supernatant liquor loses much of its intensity.

When water is charged with chlorine and agitated with air, it loses all the gas which it held in solution and becomes colorless. This fact was certainly foreseen theoretically, but the extraordinary facility with which the chlorine is eliminated by gases so little soluble as nitrogen and oxygen, was quite unknown, and it finds its application in the preparation of the aqueous solution of chlorine.

To obtain a complete saturation, it is necessary to guard against stirring the water into which the gas is driven; for if there be ever so little air in the flask, there is a displacement of a certain quantity of chlorine, and the solution is weakened.

ACTION OF SULPHURIC ACID ON ORGANIC MATTERS.*

LETTER FROM M. GERHARDT TO M. DUMAS.

My investigations concerning the sulpho-vegetable salts have already given sufficient satisfaction. I have prepared several of them which were not known before, such as the sulpho-creosotate, the sulpho-cubebate, &c., and I think I have arrived at the following general law:—

$S^2 O^6$ or one multiple, is combined with 1 equivalent of organic substance, at the same time as $H^4 O^2$ are eliminated.

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* These determinations were taken at the ordinary barometrical pressure.

* *Comptes Rendus*, No. 8.

$$C^{40} H^{16} + \underbrace{S^2 O^6, H^4 O^2}_{\text{Sulphohydrated Acid.}} = C^{40} H^{16} S^2 O^6 + H^4 O^2$$

$$\text{Salt of Baryta}: \quad C^{40} \genfrac{}{}{0pt}{}{H^{14}}{Ba} S^2 O^6$$

But when the organic substance is neutral (carburetted hydrogen, essential oil, &c.), the acid produced is monobasic.

When the organic substance is already a monobasic acid, the product is a bibasic acid, as sulpho-benzoïc, and sulpho-acetic acids.

When the organic substance is a bibasic acid, the product of its combinations is a tribasic acid, as, for example, sulpho-succinic acid.

New reflections concerning the equivalents proposed by me for water and carbonic acid $H^4 O^2$ and $C^4 O^4$, have led me to ascertain that the formulæ of the greater number of organic substances (especially those at four volumes of vapor) are twice as high as they ought to be, compared with the formulæ adopted for expressing the equivalents of mineral substances. Hence arises this peculiarity. My assertion is therefore entirely correct. I have proved, for example, that acetic acid is not $C^4 H^8 O^4$,

But . . . . . $C^2 H^4 O^2$;
Acetate of silver . $C^2 (H^3 Ag) O^3$;
Chloracetic acid . $C^2 (H Cl^3) O^2$;
Chloracetate of silver $C^2 (Ag Cl^3) O^2$.

(The symbols express equivalents,) oxygen being 100, the equivalent of water being $H^2 O = 112{\cdot}5$; atom, volume and equivalent being synonymous. The metallic oxides corresponding to water, are $Po^2 O$, $So^2 O$, $Ag^2 O$, &c.

According to that, I hold the most direct and the most positive proof that no water exists in our acids (since chloracetic acid contains only one equivalent of hydrogen, whilst water contains two), and no oxides in our salts. This fact is entirely contrary to the electro-chemical theory, and nothing more remains for us but to represent the salts according to your theory of types.

Here is, besides, a fact entirely in accordance with this mode of viewing it.

1. When a mineral substance whose equivalent is represented by two volumes of vapor ($S O^2$, $S O^3$, $H^2 O$, $H^2 S$, $C^2 O$, $C^2 O^2$) combines with an organic substance having 4 volumes of vapor, you always see twice 2 volumes = 4 volumes of this mineral substance combine with the organic substance; the same thing is observed when these same mineral substances separate from the organic substance. Thus $S^2 O^4$, $S^2 O^6$, $H^4 O^2$, $C^4 O^4$, &c., enter into combination with it or separate from it (isatosulphites, thionidrates, sulpho-vegetable salts, formation of hydrocarbons, &c.

When a mineral substance whose equivalent is represented by *two* volumes combines with an organic substance having likewise 2 volumes, (you know that the number of them is very small), 2 volumes of the first combine with 2 of the second, or equal volumes combine. It is the same when the mineral substance is separated from the vegetable substance.

2. When a mineral substance having 4 volumes of vapor ($H^2 Cl^2$, $H^2 Br^2$, $N^2 H^6$, &c.) combines with an organic substance likewise having 4 volumes; or when it is separated from it, the combination or the decomposition is effected in equal volumes. $H^2 Cl^2$ here corresponds to $H^4 O^2$, in the first case, as I have already observed in my Memoir on the essence of valerian with respect to borneïne, in speaking of the camphors.

When a mineral substance having 4 volumes combines with an organic substance having 2 volumes, 4 volumes of the former combine with twice 2 = 4 volumes of the latter. It is the same in separating.

These anomalies may easily be made to disappear, by representing the equivalents of organic substances by 2 [illegible] volumes of vapor, as in the formulæ of mineral chemistry; or else by representing mineral substances by 4 volumes, as in organic formulæ.

At the first opportunity, I will develope these facts in a more complete manner. For my part, it is demonstrated that our organic formulæ are for the most part twice as high as they ought to be, compared with mineral formulæ, oxygen being = 100.

I have read with a lively interest your Memoir *"On the Neutral Nitrogenous Matters of Organization"* (*see* THE CHEMIST, Jan. and Feb. 1843). I have profited by your experiments for establishing a relation between the principles of the blood, and the tissues of the organism:

$$\text{Protein} + O^{20} = \text{corneous tissue} + 4\ (C^4 O^4) + 2\ (H^4 O^2);$$
$$\text{Protein} + O^{22} = \text{tunic of the arteries};$$
$$\text{Protein} + O^{24} = \text{cellular tissue} + 4\ (C^4 O^4) + 2\ (H^4 O^2), \text{\&c.}$$

MEMOIR ON THE BILE.*

BY BERZELIUS.

In The Chemist for August, 1840, we published a Memoir, by M. Berzelius, "*On the Composition of the Bile.*" The author then announced his intention to pursue the study of this interesting body, and reserved to himself the opportunity of making in his work the changes and additions which the continuation of his experiments might require. His work is terminated, and we now lay a summary of his investigations before our readers.

After having presented the history of our knowledge concerning the bile, and having animadverted on the contradictions which most recent investigations present, Berzelius proceeds in the following terms:—

These circumstances determined me to undertake a new analysis of bile. I am now about to make known, in few words, the results of this analysis. According to these investigations, the most essential and most abundant principle of the bile, is a peculiar body, very soluble in water, of a bitter taste, which has an extreme tendency to undergo metamorphoses in certain circumstances; it then produces taurine, ammonia, and two resinoïd acids which, in combining with the portion of this principle which is left intact, give rise to an acid body, and the latter forms combinations with bases, without any separation of the peculiar principle. I give to this principle the name of *bilin.* It forms the greater part of the picromel of Thénard, and of the biliary sugar of Gmelin; the granular crystallisation of the latter arose from a mixture of salts.

Bilin does not crystallise; when pure, it dries into a colorless, transparent mass. It is ordinarily obtained of a yellowish color; but the latter is owing to a mixture of foreign colored matter. When left in a warm place, it cracks in all directions; heated to 120° C., it loses water, swells up, and is converted into a white, porous, and easily pulverised mass. It readily re-acquires from damp air the water which it has lost; it recombines into a mass and gradually again becomes transparent. It is inodorous; but if a concentrated solution be evaporated by heat, it gives out the odor of boiling gelatin. It has an acrid and bitter taste; it always leaves at the posterior part of the tongue a sweet after-taste of licorice, which, however, may vary. Perhaps it belongs properly to bilin; it may, nevertheless, also arise from another matter foreign to this substance, *glycerine.* Bile contains, indeed, oleate, margarate and stearate of soda, consequently, saponified fat, and the bile contains the glycerine which is separated from it; the latter must remain in the bilin, from which it is impossible to isolate it by the methods employed for the separation of the latter. Bilin contains nitrogen, and gives ammonia by dry distillation. It may be inflamed in the air, and burns with a clear, fuliginous flame, leaving a porous ash. It is soluble in all proportions in water and anhydrous alcohol, and insoluble in ether. Its reaction is neither alkaline nor acid; but it forms very soluble compounds with acids as with bases; these latter are decomposed by the carbonic acid of the air. Its combination with an alkali may be completely precipitated by a concentrated solution of a caustic alkali or an alkaline carbonate. This circumstance may be turned to account for freeing it from the salts held in solution in the latter then remain in the liquor, and may be completely separated from it by several precipitations.

Bilin has, as I have said, a great tendency to undergo alterations. It is impossible to evaporate its aqueous solution to dryness, by heat, without its experiencing a slight alteration; it then begins to give feeble indications of the presence of a free acid. The mineral acids and the mucus in solution in bile very considerably accelerate this alteration. The action of acids, in this case, gives rise to the products indicated by M. Demarçay. Bilin is converted into two resinoid acids, taurine and ammonia. I have given to these acids, which greatly resemble one another in physical properties, the names of *fellinic* and *cholinic* acids. They are sparingly, or not at all, soluble in water; alcohol dissolves them in all proportions; fellinic acid is very soluble in ether; cholinic is only sparingly soluble in it. They form with the alkalis, earth, and metallic oxides peculiar salts; the alkaline salts are very soluble in water and alcohol, possess the bitterness of bile, froth in solution like soap, and remain after evaporation under the form of masses resembling extracts. The earthy and metallic salts are insoluble or very sparingly soluble in water. The difference of solubility of their salts of baryta, in alcohol, presents the best means of isolating them. The fellinate is very soluble in that menstruum; the cholinate, on the contrary, is almost insoluble in it. At the same time that these acids are formed by the alteration of bilin, they are combined with a portion of that substance which then enters with them into the composition of their salts. I call these acid compounds *bilifellinic* and *bilicholinic acids.* They are soluble in water; but the addition of a certain quantity of a mineral acid precipitates them from it: if the supernatant liquor be decanted, and if fresh water be added, they re-dissolve.

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* *Journal de Pharmacie,* March, 1843.

Ether removes from them a certain quantity of fellinic acid; if the remaining mass, which is richer in bilin, be dissolved in water, and if the solution be supersaturated with oxide of lead, basic bilifellinate and bilicholinate of lead are formed, and separate under the form of a plastic mass, and the excess of bilin remains in the liquor. The result is the same when the latter is mixed in a certain proportion with sulphuric acid. Bilifellinic acid is then precipitated, and the bilin remains in solution with the excess of sulphuric acid, from which it is freed by means of carbonate of lead, lime or baryta. The neutral compounds of bilifellinic and bilicholinic acids with bases are soluble in water and alcohol, and have the bitterness of bile. Their solutions in water froth by agitation.

The mixture of the two acids combined with bilin constitutes the cholic acid of Demarçay, and the principal mass of M. Thénard's resin of bile. If these acids be boiled for some time with hydrochloric acid, they are converted into a neutral isomeric modification, insoluble in water and sparingly soluble in alcohol, even at the boiling heat; they are deposited from the latter liquid under the form of a white pulverulent substance not susceptible of combining with bases, and insoluble in hydrate of potassa. I have named it *dyislysin*. But it is possible to bring them to their primitive state by treating them with an alcoholic solution of hydrate of potassa. They are sometimes obtained in another neutral state in the analysis of bile; they are then very soluble in alcohol; but they cannot combine with an alkali so long as the latter is in solution in the water. They combine with it only when their digestion in the alcoholic solution of hydrate of potassa is prolonged until the greater portion of the alcohol is evaporated. Bilin in the pure state undergoes only a very slight alteration by boiling with hydrate of potassa: I have not been able in this manner to convert it into cholinic acid.

Another and no less remarkable principle of the bile is the substance which communicates to it its brownish yellow color, and whose reaction with nitric acid is so characteristic. If nitric acid be gradually added to a liquor containing the substance in solution, it first becomes bluish; it afterwards turns green, then violet, red, and finally yellow or brown-yellow. This reaction may be produced in bile; but it is impossible, in its analysis, to separate from it any peculiar substance which it presents, because the body undergoes changes in the various reactions. Nevertheless, it is sometimes found suspended in the bile, under the form of a yellow powder; or else it is collected in the gall bladder, and forms a concretion or calculus, which then gives with nitric acid the above-mentioned characteristic reaction. It was by this means that it was possible to study the properties of this substance in the isolated state. I propose to designate it by the name of *cholepyrrhin*.

Cholepyrrhin is sparingly soluble in most liquids, of a fine red-yellow color, which is rendered deeper by trituration. It is insipid and inodorous; it contains nitrogen in its composition and yields ammonia by dry distillation. It is very sparingly soluble in water, and communicates to it a pale yellow color; it is rather more soluble in alcohol, but its solution in it is always very weak. Its best solvent is a solution of caustic soda or potassa; ammonia has little action on it. It absorbs oxygen from the air in this solution, and the yellow color of the liquid then gradually becomes green. If the solution be still yellow, or already green, the acids precipitate this substance in green flocks, which have all the properties of chlorophylle. I have named it in this state *biliverdin*. It is then no longer cholepyrrhin, but a product of its alteration.

Biliverdin is naturally not the only product of this metamorphosis, but the others are not yet known. It dissolves in bile in the nascent state, in the alkaline combination of bilin, and if it be separated in greater quantity than the bile can dissolve, it renders it turbid and finally unites into a mass easily distinguished from biliary calculi formed of other substances, by the beautiful red-yellow color which it takes by trituration. When the bile gradually turns green, this phenomenon is due to the metamorphosis of cholepyrrhin and the formation of biliverdin; this metamorphosis is sometimes operated in the animal body, and in certain animals the bile is always green when drawn from the bladder.

Mucus is a third principle of the bile which merits peculiar attention in a physiological point of view. It is probably found mixed with bile only after its extraction from the canals and from the gall bladder. A portion of the mucus is only swelled in bile; but it fills it sufficiently to render it stringy and to make the upper portion of the filament, which is separated in pouring it, return on itself. This portion of the mucus may, however, be isolated by straining, and remains on the sieve. Bile thus strained does not any longer *draw out;* but it contains in solution a portion of mucus which may be separated in two ways. If the bile be mixed with its volume of alcohol of 0·84, the mucus is separated and may be collected on a filter, without altering the composition of the bile. The mucus may also be precipitated by the addition of a few drops of a free acid, even acetic acid; but then the acid commences by saturating the alkali of the alkaline compound of bilin; then the mucus is precipitated in the state of insoluble combination with the acid, and it may afterwards, by means of an exact proportion of alkaline carbonate, be restored to the state of mucus with its primitive properties. The presence of this body in bile produces a continual metamorphosis which is sometimes completely stopped, as soon as it is separated by means of alcohol. The color of bile becomes deeper and always more green; it acquires a stronger and more disagreeable odor; it begins to give out white vapors when held over a glass rod which has been dipped into hydrochloric acid; then it contracts an evidently ammoniacal odor, and if it be then mixed with an acid, a plastic precipitate is obtained, which is insoluble in pure water, and little or no free bilin remains in the liquor in which the precipitation is operated; the latter contains, in solution, on the contrary, taurin and ammoniacal salts. Even when recent bile, mixed with mucus, is evaporated to the consistence of an extract, the metamorphosis always continues. A bile of this nature rarely contains free bilin, as my investigations have shown me; it presents, besides taurin and ammonia, cholinic and bicholinic, fellinic and bilifellinic acids, two new acids which I have described under the name of *fellanic and cholanic acids*. In general cholinic acid is the most abundant of all these principles.

These three bodies, bilin, cholepyrrhin, and mucus, are, in my opinion, the most remarkable principles of bile in a physiological point of view. I have also found, after the separation of biliverdin, another yellow coloring matter, which I have called *bilifulvin*. It is a double salt of lime and soda, with a nitrogenous organic acid, which I have called *bilifulvinic acid*. In the isolated state, this acid is insoluble in water and in alcohol; it separates from it in pale yellow flocks, when it is precipitated from the aqueous solution of the salt by a more energetic acid. Is this salt originally a principle of the bile? or is it rather a product of the metamorphosis? This it is impossible to decide.

The following are the other principles which I have found in the bile:—

Extractiform matters partially soluble in aqueous alcohol and in water, and partially in water alone; identical, so far as can be judged from their general properties, with the matters which correspond to them in the blood, but of a deeper yellow, arising from bilifulvin, from which they may, but with difficulty, be completely freed.

Cholesterine,—the best means of detecting the presence of which consists in digesting, for some hours, bile deprived of mucus, with a little dilute sulphuric acid; cholesterine rises to the surface of the liquor in proportion as the bilin is destroyed, and it may be removed after cooling:

Oleate, margarate, and stearate of soda with a little non-saponified fatty matter, from which it is not possible to separate seroline:

Chloride of sodium, sulphate, phosphate and lactate of soda, and phosphate of lime.

From the preceding it results that the ancient comparison of the bile with a solution of soap is not entirely incorrect, inasmuch as it really contains, in solution, a small quantity of soap. But it is not possible to determine with entire accuracy the proper composition of the bile in its primitive state. Nor is it possible, positively to indicate the relative proportions of its principles, since it constantly alters during analysis. It may be added that we are not possessed of very accurate methods of separation. The quantitative analyses given above should be regarded only as approximations, and it may with probability be concluded that bile and blood, at least in the ox, are liquids of very similar concentration.

In my experiments, filtered ox-bile, by evaporation to dryness and by desiccation of the residue at 130° C. until it ceased to diminish, lost 92·838 per cent. of its weight, and left 7·162 of solid substances. The mucus extracted from a portion of the same bile by precipitation with alcohol, represented, after desiccation, 0·231 of a hundredth of the weight of the filtered bile, and left, after combustion, and incineration, 0·026 of a hundredth of the weight of bile, formed of bone phosphate of lime, unmixed with free lime or carbonate of lime. Ether removes cholesterine from the dry residue of the bile; but its quantity does not form more than 0·0001 of the weight of that liquid. The portion of the residue of bile insoluble in alcohol, the extractiform matter with the alkaline sulphate and phosphate, represented 0·4334 of a hundredth of the weight of bile. If we were to admit that the chloride of sodium, lactate of soda and extractive matters soluble in alcohol amount to 1½ per cent., an estimation perhaps too high, there would remain for bilin and cholepyrrhin (the proportion of the latter is very small) 5 per cent. of the weight of the bile.

If now we carry our considerations relative to the bile into the uncertain field of suppositions, we may regard it as probable that the bile, at the first moment of its secretion, contains bilin and cholepyrrhin, unmixed with any product of their alteration. It is only gradually and by the catalytic influence of the tissue of the ducts and of the mucus that these products begin to show themselves. In the state of perfect health, the metamorphosis does not make much progress in the body itself, because the bile is not long retained in it; but it continues after it has left the body, and the bile undergoes an increasing alteration producing taurin, bilifellinic and bilicholinic acids, biliverdin, &c., so long, at least, as the mucus has not been separated from it. It is for this reason that fresh bile from a healthy bull may be mixed with any quantity of sulphuric acid diluted with 3 or 4 times its weight of water, without precipitating from it, in the space of 24 hours, anything but the mucus in solution. It is evident, therefore, that fresh bile contains so little bilifellinic and bilicholinic acids, that they can remain in solution in the acid liquor. On the contrary, fresh bile always gives a precipitate, weak as it may be, with basic acetate of lead; it is partly formed, it is true, of other substances; but its property of agglutinating into a plastic mass, indicates the presence of basic bilifellinate of lead. Hence it necessarily results that the metamorphosis of bile has already commenced before leaving the bladder. In the present state of the analytical investigations concerning the bile of different species of animals, we are constrained to admit that the bile of man and of the mammalia is very similar in nature to that of the ox. M. Thénard says, indeed, that that of the pig contains no picromel, but only the resin of bile, which signifies, in other terms, that it does not contain free bilin, but bilifellinic and bilicholinic acids. It is very possible that in certain animals the metamorphosis may be more advanced in the bladder than in others; but it is still more probable that the bile examined by M. Thénard had undergone this degree of alteration before it was analysed. Gmelin found in the bile of the dog considerably less bilifellinic acid than in that of the ox; that is to say, less progress had been made in the alteration.

Gmelin found the bile of birds already green in the bile bladder, presenting different degrees of a fine green. It formed a more dilute solution than that of the mammalia; but his investigations concerning the bile of geese and hens lead to the conclusion that its composition is the same as that of the bile of the mammalia.

The bile of fishes presented to Gmelin essential differences, compared with that of mammalia. The bile of different species of cyprinus (*Leuciscus, barbus* and *alburnus*), left a confusedly crystallised residue, in which Gmelin discovered a new crystallised body which supplies the place of bilin. This body may be called *ichthyocholin.* It is colorless; it has at first a sweetish taste, but an extremely bitter after-taste; it readily crystallises; it is very soluble in water and in alcohol; insoluble in ether, and appears to contain less nitrogen than bilin, since it gives only slight indications of it by dry distillation. A considerable addition of caustic potassa, or carbonate of potassa, precipitates it from water like bilin; but the free acids likewise precipitate it, although an excess redissolves it; it may be precipitated *de novo* by dilution; it is also precipitated from its aqueous solution by subacetate of lead, as well as by the salts of tin, mercury and silver; it appears, therefore, to be capable of combining with bases. Gmelin found, in the ashes of the bile of fish, sulphates of soda and lime, with a little phosphate of lime, but no free alkali; the fresh bile had not an alkaline reaction. It is more concentrated than that of the mammalia: Gmelin obtained from the bile of fish, by desiccation, from 14·3 to 19·3 per cent. of residue. The bile of the *Esox lucius* and of *Salmo fario* left a residue which did not crystallise; it is probable that it contained bilin as well as ichthyocholin, and that the presence of bilin prevented the crystallisation of the latter.

The bile of the amphibia has been little studied. Gmelin has demonstrated that the bile of the *Coluber natrix* and of the *Rana temporaria* contains cholepyrrhin. I have analysed the bile of the *Python bivittatus*; it contained bilin,—but no bilifellinic acid,—ichthyocholin and cholepyrrhin with the other ordinary principles of animal fluids. Ichthyocholin is therefore presented in the amphibia.

The physiological purpose of bile is not easily penetrated. According to former investigations and opinions, it was believed that it was mixed with the chyme in the duodenum, to operate a precipitation in it; the precipitated portion formed the excrement, and was eliminated; the unprecipitated portion constituted the chyle, which was absorbed. But this very chemical opinion has not been confirmed by more recent and more carefully conducted investigations. It was then endeavored to give prevalence to the opposite opinion, that the bile is only an excretion, without any other purpose as regards the act of digestion. In different species of animals, the liver was compared with the respiratory organs, and, from this comparison, it was concluded that the former is so much the more developed as the latter are smaller, and that the diminution in the separation of carbon from the blood in the lungs, is here compensated by a more abundant excretion of carbon by means of the bile. Several physiologists have tried to tie, in living animals, the common biliary canal to the liver and to the bladder. Brodie* thought that he found, by experiments of this nature on cats, that chyle is not formed without bile; but the act of chylification may easily be disturbed by influences much slighter than the incision of the abdomen and ligature of the biliary canal. Tiedemann and Gmelin made similar experiments on dogs, and did not find in the contents of the small intestine any essential difference from the normal state beyond the absence of the principles of the bile. I have myself made an observation which greatly agrees with this last result. At the age of 18, I was attacked with jaundice, which produced no other suffering than a *dull* pressure in the hepatic region, and which could scarcely be called a disease. The excrements were white, and at the end of a week the skin began to turn yellow. This was the first indication of the disease, and remedies were employed, which effected a cure at the end of 12 days. During all this time, there was no absence of appetite, and I continued my ordinary occupations in and out of doors, without the least sign of fatigue or weakness; however, these symptoms ought to have followed as a necessary consequence if the act of chylification had been interrupted during those 12 days.

If, on the other hand, it be considered, that in most animals the bile is poured into the commencement of the intestinal canal, that it is there mixed with the aliments which come from the stomach, and that, in animals which are provided with a gall bladder, the overflowing of the bile is confined to the time of digestion, we may,—in the conviction which the study of physiology gives us, and which it is constantly fortifying,—in the conviction, I say, that nothing exists in the admirable structure, without a special and well-calculated object,—admit, with extreme certainty, that the bile, without being a *sine quâ non* condition for chylification, must, however, have an essential influence on the integrity of that function.

That the bile is an excretion is demonstrated by the fact that the excrements of animals contain not only the products of the metamorphosis of bile, but also bile which is not yet destroyed, and which has not undergone a complete metamorphosis.

Finally, bile, evaporated and employed as a medicine, under the name of *bilis bubula spissata* deserves to be mentioned. I have observed that it contains bile in a very advanced stage of metamorphosis. This alteration might be greatly impeded by precipitating, before evaporation, the mucus from the bile by mixing it with its volume of alcohol of 0·84, filtering, removing the alcohol by distillation, and afterwards evaporating the bile in a sand bath, until it hardens after cooling. It may then be kept for a long time without alteration.

THE COMPOSITION AND PRODUCTS OF DISTILLATION OF SPERMACETI, WITH SOME FEW REMARKS UPON ITS OXIDATION BY NITRIC ACID.*

BY LAWRENCE SMITH, M.D., OF CHARLESTON, S. C.

(*Concluded from p.* 209.)

CONCLUSION AS REGARDS THE COMPOSITION OF SPERMACETI CONSIDERED AS A FAT.

Before coming to this conclusion a *résumé* will be made of the results which have been arrived at in the different steps of this investigation. As regards *athal*, or what is considered the base of spermaceti, nothing has been brought to light to change in any way the statements made concerning its nature. *Oleïc and margaric acids* have been proved not to exist in spermaceti. From the saponification of spermaceti, prepared as it was for these experiments, a small quantity of a fluid acid was obtained, but for reasons before stated, considered as an impurity. The acid product arising from the saponification of spermaceti, was found to consist almost entirely of *athalic acid*.

From these facts, *spermaceti*, considered as a fat, (I make this qualification, as a little farther on it will be attempted to be shown that it is not, properly speaking, a fatty body,) is composed of one acid and one base, the former being *athalic acid*, and the latter *athal*, and that it is an *athalate of athal*, consisting of—

		Atomic Weight.
One atom anhydrous athalic acid . .	$C^{32}\ H^{31}\ O^{3}$’	249·18
One atom anhydrous athal	$C^{32}\ H^{33}\ O$’	235·18
One atom spermaceti	$C^{64}\ H^{64}\ O^{4}$’	484·36

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* *Journal of the Royal Institution of Great Britain*, Vol. XIX. p. 341.

* *Silliman's Journal*, October, 1842.

That this is no doubt the true composition of spermaceti, will be seen by the results afforded by the analysis of this substance, prepared by crystallising it out of absolute alcohol.

Exp. i.—0·306 gram. spermaceti burnt with the binoxide of copper, gave 0·8945 gram. carbonic acid, and 0·370 gram. water.

Exp. ii.—·2385 gram. spermaceti burnt with the binoxide of copper, gave 0·691 gram. carbonic acid, and 0·282 gram. water.

Exp. iii.—0·408 gram. spermaceti burnt with the chromate of lead, gave 1·198 gram. carbonic acid, and 0·486 gram. water.

Exp. iv.—0·314 gram. spermaceti burn with the binoxide of copper and oxygen, gave 0·913 gram. carbonic acid, and 0·370 gram. water.

Exp. v.—0·212 gram. spermaceti burnt with binoxide of copper and chlorate of potassa, gave 0·625 gram. carbonic acid, and 0·252 gram. water.

Comparing the percentage of carbon, hydrogen and oxygen, afforded by these experiments, with that given by the supposed composition of spermaceti, ($C^{64} H^{64} O^{4}$) we have in 100 parts :—

	Atoms.	Atomic Weight.	Calcul.	Found.				
				1.	2.	3.	4.	5.
Carbon . .	64	388·36	80·18	80·36	79·66	80·70	79·91	81·08
Hydrogen .	64	64·00	13·22	13·53	13·12	13·23	13·40	13·21
Oxygen . .	4	32·00	6·60	6·11	7·22	6·07	6·69	5·71
		484·36	100·00	100·00	100·00	100·00	100·00	100·00

DISTILLATION OF SPERMACETI.

The products furnished by the distillation of spermaceti were examined some time since by Bussy and Lecanu, but they appear to have fallen into the same error with regard to them as was committed in the analysis of spermaceti, for they state that oleïc and margaric acids were among the products.

To make a correct examination of the products of the distillation of spermaceti, it was necessary that the substance should be in the greatest state of purity, as the presence of the smallest quantity of tallow, sometimes used as a means of adulteration, would serve to lead one into error. The manner of purification here employed, was to dissolve the spermaceti in a mixture of two parts of alcohol, of ·820, and one part of ether, allowing it to crystallise out, and washing the crystals with boiling alcohol of ·820.

If some of the spermaceti, purified as just mentioned, be placed in a small retort, and this last in mercury heated to its boiling point, the spermaceti will be found to distil over slowly: and, in fact, this appears to be the lowest temperature at which the distillation takes place—a temperature of about 600° Fah. The matter distilled no longer possesses the properties of spermaceti; its melting is at a temperature somewhat lower, and it has a strong acid reaction upon litmus paper, as well as a peculiar smell, which, though, is not at all that of *acroleïne*.*

If the products afforded by the distillation be digested with water, and this water be examined, it will be found not to possess the slightest acid reaction, a fact of considerable importance, and one that has been mentioned in a former part of this article, as an evidence of the non-existence of oleïc acid in spermaceti,—oleïc acid or any of its compounds always furnishing by distillation sebacic acid, an acid soluble in water. The water, moreover, will be found to have taken up nothing, it having simply acquired a slight odor, resembling that of the mass with which it was digested.

The steps taken to ascertain the nature of the products were the following. The mass obtained from the distillation was digested with a solution of potassa for an hour or two, and to this, placed in a convenient vessel, was added ether, and the two agitated together, and then allowed to repose. The ether arose to the surface, containing in solution certain products; this was drawn off, and a fresh portion added, and the agitation repeated. This operation was carried on until nothing remained that was soluble in this menstruum.

The ether was evaporated, and a residue obtained, consisting of an oily fluid, holding spermaceti in solution. The separation of the oil from the spermaceti was attended with considerable difficulty, but by the aid of pressure at a very low temperature, and careful distillation, a small quantity of the oil was obtained tolerably pure.

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* If tallow be heated until it distils, it will be found to possess an odor which irritates both the nostrils and eyes, and the substance to which this odor belongs is called *acroleïne*, and is a product of the decomposition of the glycerine in the tallow. It has been found, that all bodies that contain glycerine, when heated sufficiently high, give the same odor, and it has therefore become the test for the glycerine.

0·222 gram. of the oil, burnt with the binoxide of copper, gave 0·688 gram. carbonic acid, and 0·282 water, and this in 100 parts, gives:—

Carbon	85·04
Hydrogen . . .	14·12
	99·16

These numbers show it to be a carburetted hydrogen, composed of equal equivalents of carbon and hydrogen, and this, together with such of its physical properties as I was able to examine, lead me to believe it to be *ceten*, the carburetted hydrogen already spoken of as the supposed base of *athal*. Considering this oil to be *ceten*, its composition is represented by—

		In 100 parts.	
Atoms.	Atomic Weight.	Calculated.	Found.
32 Carbon,	194·18	85·85	85·04
32 Hydrogen,	32·00	14·15	14·12
	226·18	100·00	99·16

The solution which had been treated with ether, was now perfectly transparent, and contained potassa in combination with the acid products resulting from the distillation. To this was added a solution of chloride of calcium, by which means an insoluble compound of the acids and lime was formed, and this being decomposed by hydrochloric acid, furnished the acids for examination.

Although it was evident from what had been before done, that no oleïc acid could be present, yet to prevent any doubt, I made a direct examination for this acid, by digesting a portion of the acid mass with water and oxide of lead, and then treating the lead salt thus formed with ether, which dissolved no portion of it. The portion of the acid product not digested with the oxide of lead, was found to consist of a solid acid, mixed with a very small quantity of a fluid one, which I considered to be the same that has been before mentioned, as a probable impurity of spermaceti, and for the same reasons there stated, it was impossible to make any examination of it.

The solid acid, which was obtained pure by repeated crystallisation out of alcohol, exhibited the same physical properties as well as chemical composition, as the acid obtained from the saponification of spermaceti, and which has been shown to be *athalic acid.*

0·2715 of the acid gave 0·739 gram. carbonic acid, and 0·306 gram. water, making in 100 parts:—

	Hydrated Athalic Acid.	
Carbon .	75·00	75·21
Hydrogen	12·52	12·39
Oxygen .	12·48	12·40
	100·00	100·00

0·8625 gram. of the silver salt, when burnt, gave 0·254 gram. silver, which indicates in 100 parts, 29·44 silver, 31·61 oxide of silver, and an atomic weight of 250.

0·481 gram. of the silver salt, burnt with the oxide of copper, gave 0·932 gram. carbonic acid, and 0·368 gram. water. The percentage afforded by this will serve to show the identity between it and *athalic acid.*

			In 100 parts.	
Athalate of Silver.	Atoms.	Atomic Weight.	Calculated.	Found.
Carbon	32	194·18	53·16	53·28
Hydrogen	31	31·00	8·48	8·50
Oxygen	3	24·00	6·57	6·61
Oxide of silver	1	116·13	31·79	31·61
		365·31	100·00	100·00

In the distillation of spermaceti there are other products found than those just mentioned; but they appear only towards the latter end of the process, and result from an elementary decomposition; they are water, carbonic oxide and gaseous carburetted hydrogen, carbon being left behind in the retorts; and these products are very small in quantity, except when the vessel is very deep and the heat strong.

If proper care be taken, spermaceti can be distilled almost completely, there being left behind an exceedingly small black residue. A circumstance which facilitates this complete distillation is, having kept the spermaceti for some time at the temperature of 550° to 600° Fah.

The results of the investigations upon the distillation are, first, that it is impossible to distil spermaceti without more or less of it undergoing decomposition; and secondly, that the products of this decomposition are *ceten* and *athalic* acid, which fact serves to substantiate the correctness of the formula already taken for spermaceti, thus—

One atom of ceten	$C^{32} H^{32}$
One atom of hydrated athalic acid	$C^{32} H^{32} O4$
One atom of spermaceti . .	$C^{64} H^{64} O4$

NATURE OF SPERMACETI.

From the foregoing researches, I feel somewhat prepared to speculate upon the true nature of spermaceti, for although it may be difficult to arrive at any positive conclusion with regard to it, still we should not be deterred from forming a judgment upon probabilities.

For many reasons, spermaceti would appear not properly to belong to the class of fatty bodies, and, consequently, not composed of an acid and a base. The fats, properly speaking, are known to be composed of acids, more or less different in their nature, in combination with glycerine; and when Chevreul found athal, as in spermaceti, accompanied with an acid, he considered athal as the base in this case, as well as making it the great mark of distinction between spermaceti and the fats.

Before going on to state the reasons why spermaceti should not be considered a fat, it would be well to mention what I suppose to be its proper position among the organic bodies. *Spermaceti* ought properly to be classed with *cholesterine* and *athal*, although approaching nearer to the fats than either of these substances; and that both the athalic acid and athal resulting from the saponification, are simply products of decomposition, brought about by the action of an alkali, neither of them existing ready formed.

The first reason for so believing, is based upon the extreme difficulty with which spermaceti is saponified, it requiring to be digested for a number of days in a strong solution of potassa or soda, or to be fused with the same alkalis at a temperature of from 212° to 220° Fah. before this change takes place. Now, from the experiments of Dumas and others, it will be seen that the action of hydrated potassa upon organic substances, at a temperature more or less elevated, is to decompose them, by changing their molecular arrangement, and that among the products formed, acids play the most conspicuous part. The atom of water in the alkali is often important, in bringing about this change, by furnishing oxygen, hydrogen gas being evolved; but the action of this water appears to be but a secondary thing, and its influence is only felt where oxygen does not exist in sufficient quantity in the substance acted upon by the alkali, to furnish the products that are found with the quantity that they exact.

The above would appear to apply exactly to the case in question. The spermaceti contains oxygen enough, which, when combined with one half of its other elements, serves to give rise to an acid; it is quite possible that the action of the alkali, although not sufficiently strong at the temperature of 212° Fah. to determine the elements of the spermaceti to appropriate the atom of water in the alkali to its complete conversion into *athalic acid* (I say complete conversion into athalic acid, for it will be shown that the action of an alkali at a high temperature is to convert spermaceti entirely into *athalic acid*), still is of sufficient energy to disturb its atomic arangement, most of its oxygen combining with one half of the other elements, to form an acid which unites with the potassa.

It may be said, that if this explanation of the saponification of spermaceti be true, we should apply the same to the saponification of all fats, no longer considering them composed of acids and glycerine, but simply of carbon, hydrogen and oxygen, in the proper proportions to form them. But there appears to me no necessity for forming such a conclusion, as the circumstances attending the saponification of spermaceti and that of the fats differ considerably; and if this difference be taken into consideration with what follows, there is no doubt that the justice of this explanation will be seen.

Another reason for supposing that spermaceti does not consist of an acid and a base, or rather that athal does not exist in it ready formed, is, that in the products afforded, by the distillation of spermaceti, no trace of athal is to be found. This fact is one that should be considered of great value in establishing the nature of spermaceti, for there is no way of explaining the non-existence of athal among the products of distillation except by admitting that the substance distilled did not contain it, for athal is a body easily volatilised without decomposition.

If, on the contrary, we remark the action of a strong solution of potassa upon spermaceti at 100°, we find athal to be volatilised during the process,—an evidence of the ease with which this substance is volatilised, as well as the necessity of an alkali for its formation.

Let us compare with this the action of heat upon the fats, with reference to the change that the glycerine undergoes. We find that if a fat be distilled, a portion of the glycerine is decomposed, giving rise to acroleïne (a mixture of acetic acid, &c.), and another portion passes over undecomposed; this is only exactly what takes place if glycerine be distilled alone, whereas, in the distillation of spermaceti, its athal (supposing it to contain it) undergoes *complete decomposition*, although athal, distilled by itself, does not undergo *the least decomposition.*

This second reason, then, serves to increase the difference between the nature of spermaceti and that of the fats; but I am able to advance another fact stronger than either of the above, augmenting this difference.

Dumas and Stass have shown, that if

athal be acted upon by potassa at a temperature of from 410° to 428° Fah. an acid is the result, which acid they called *athalic acid*, the same that has been shown to result from the saponification of spermaceti, where the same alkali was employed, but at a much lower temperature. The action, then, of potassa upon spermaceti, assisted by the proper temperatures, is to produce but one body, *athalic acid*, which circumstance would hardly take place were spermaceti composed of two or more proximate principles. We have no similar example among the fats.

Although cholesterine does not undergo any change by the action of a solution of potassa at 212° Fah., still the analogy between it and the spermaceti may exist, for it must be observed that cholesterine, having an atomic weight of more than one half that of spermaceti, contains only one atom of oxygen, and not sufficient to give rise to an acid without the aid of an additional quantity; and it is probable if cholesterine be treated with an alkali at a high temperature, that an acid similar to athalic acid would be the result, for then oxygen would be furnished from the water of the hydrated alkali.

For the above reasons, spermaceti should be considered a simple organic substance, having, as already shown, for its composition, $C^{64} H^{61} O^{4}$. The action of an alkali upon it, produces a decomposition, which may be represented thus:—

Anhydrous athalic acid in combination with the alkali . . . $C^{32} H^{31} O^{3}$
And hydrated athal, its atom of water being obtained from the alkali in combination with the athalic acid . . . . . . $C^{32} H^{33} O + HO$

Spermaceti, plus one atom of water . . . . $C^{64} H^{64} O^{4} + HO$

Under the head of the distillation of spermaceti, the decomposition brought about by the action of heat was shown to be represented thus:—

Hydrated athalic acid . . . $C^{32} H^{32} O^{4}$
Ceten . . . . $C^{32} H^{33}$

$C^{64} H^{64} O^{4}$

OXIDATION OF SPERMACETI.

Having made mention of the oxidation of spermaceti, as one of the evidences of the non-existence of oleïc acid in this substance, I shall give a short statement of what has been done under this head, although but little, owing to the difficulty of isolating the products that are formed.

When nitric acid and spermaceti are heated together, a gentle action takes place, and nitrous acid fumes are given off; at the end of three or four days the spermaceti still floats upon the surface of the acid, but considerably changed in its nature, having nearly the consistence of hog's lard, and an odor of rancid butter, owing probably to the presence of phocenic or butyric acid, but I am more inclined to believe phocenic acid, as this acid is found in the oil in connection with which spermaceti is found in ts natural state, and the spermaceti may no doubt play some part in its formation; his fact is interesting, and worthy of future xamination.

The action of the acid being continued, renewing it as it evaporates,) in about ten days the spermaceti is in complete solution when the liquid is hot, and at the expiration of eighteen or twenty days the oxidation is ompleted, and if the solution be concenrated, a crystalline deposit takes place.

The examination of the products formed s as yet imperfect: the following is all that as been done that can be relied upon as ccurate.

After the completion of the oxidation, the mass was thrown upon a funnel, containing in its neck a piece of asbestos; the fluid was thus separated from the crystalline deposit, which was washed with strong nitric acid. The fluid that passed through, upon concentration, furnished more of the same crystals.

The crystalline mass in the funnel gave, upon examination, no traces of suberic acid, but when dissolved in water, and allowed to cool, a deposit slowly took place, having the forms of little grains and the appearance of starch. Its reaction is strongly acid, and when crystallised several times from its aqueous solution, and dried at 212° Fah., it has a melting point of 298° Fah. It sublimes easily in feather-formed crystals; its ammoniacal salt does not precipitate the chlorides of lime, of baryta and strontia, the sulphate of copper, sulphate of zinc, or neutral acetate of lead. With the basic acetate of lead, a precipitate is formed, which is soluble in an excess of the lead salt. 0·3645 gram. of this acid, burnt with the binoxide of copper, gave 0·666 carbonic acid, and 0·230 water: in 100 parts:—

Carbon	50·20
Hydrogen	7·00
Oxygen	42·80
	100·00

The silver salt is easily formed by double decomposition with the ammoniacal salt and nitrate of silver. It is slightly soluble in water, and not easily altered by the action of light.

Exp. i.—0·525 gram. of this salt when burnt gave 0·294 gram. silver.

Exp. ii.—0·612 of this salt when burnt gave 0·343 gram. silver.

These give in 100 parts—

1. 50·01 silver, or 60·00 oxide of silver.
2. 56·05 ,, 60·19 ,,

Burnt with the binoxide of copper:—

Exp. i.—0·708 gram. silver salt gave 0·582 gram. carbonic acid, and 0·174 gram. water.

Exp. ii.—0·787 gram. of silver salt gave 0·6465 gram. carbonic acid, and 0·190 gram. water.

These experiments gave the following percentage:—

	1.	2.	Mean.
Carbon . .	22·56	22·60	22·58
Hydrogen . .	2·68	2·68	2·68
Oxygen . .	14·67	14·63	14·65
Oxide of silver	60.09	60·09	60·09
	100·00	100·00	100·00

Out of this the following formula of a bibasic salt is calculated:—

	Atomic Weight.	In 100 Parts. Calculated.	Found.
Carbon . .	84·95	22·18	22·58
Hydrogen . .	10·00	2·66	2·68
Oxygen . .	56·00	14·65	14·65
Oxide of silver	232·20	60·51	60·09
	383·20	100·00	100·00

This formula agrees with that of the adipinate of silver, as made out of Bromeis, with the unimportant difference of one atom of hydrogen, and its physical properties and reactions are the same as adipinic acid: I consider it as such.

None of the other acids afforded by the oxidation of spermaceti have been obtained in a state of sufficient purity to be examined. There is however one among them, whose copper and zinc salts are more soluble in cold than warm water, and if a solution of either of them be heated, a precipitate is formed, which redissolves upon cooling; this phenomenon is most striking in the zinc salt. Those portions of the examination of this subject that are as yet incomplete, I propose finishing at some future time.

ON A DEVELOPEMENT OF OXYGEN GAS ARISING FROM THE ORGANIC DEPOSIT FROM THE WATER OF A SALINE SPRING.*

BY WÖHLER.

In a Memoir on the composition of the saline springs of Rodenberg in Hesse, Pfankuch mentions a remarkable phenomenon—the presence of oxygen gas in the midst of the mucilaginous mass formed in the cisterns which contain the waters of the saline spring. Wöhler had an opportunity, last summer, of seeing this phenomenon at the same place. The following is the result of his observations:—

The mucilaginous mass in which the gas is developed, is produced under the waters of the spring at the bottom of the wooden cisterns, that is to say, the open conduits in the form of cisterns at the top of the *graduation*, from which the saline water is poured on bunches of nettles. The water, raised by pumps, remains there for a longer or shorter time, exposed to the free access of air and to the full sun. It appears perfectly limpid, and contains about 5 per cent. of chloride of sodium, and so great a quantity of sulphate of lime, that the nettles are gradually covered with a thick crystallisation of this salt. The saline spring of the building of graduation, where the mucilaginous mass is formed, has already been graduated once. Recently drawn from the well, which is about 162·420 metres in depth, it contained, besides pure carbonic acid, so considerable a quantity of sulphuretted hydrogen gas, that it might pass for a sulphurous water. It becomes, however, perfectly inodorous in the cisterns, after the first cascade. It is here that there is formed in the summer months by a long duration of warm and fine weather, a mucilaginous mass which covers to a considerable extent the bottom of the cisterns to the height of $0^{m\cdot}$ 014 to $0^{m\cdot}$ 027. It has a variable, greyish-yellow color, and a viscous membranous appearance, very similar to a half-putrefied animal membrane; it has, even after washing, an odor analogous to that of fish, or of the sea. It is filled throughout with large gaseous bubbles. It envelopes them so solidly, that they cannot disengage themselves; but they rise in great quantity as soon as the envelopes are torn by means of a stick. Nothing is more easy than to collect this gas for examination; for the quantity of bubbles is so considerable, that during Wöhler's stay, some hundreds of bottles might have been filled in a short time. This gas is so rich in oxygen, that a splinter in ignition which was introduced into it, inflamed and burned with a brilliant flame. The author found that it was formed of 51 per cent. of oxygen gas, and of 49 of nitrogen in volumes; he does not doubt that this gas was, in the first instance, pure oxygen, but which was, in the same manner as a gas in an animal envelope, gradually mixed with atmospheric air; this alteration must especially take place, when, as it often happens, the level of the saline water is very low in the cisterns, and when the mucilaginous mass and the bubbles are almost in contact with the air.

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* *Annalen der Chemie und Pharmacie.*

By a microscopical examination of the mucoso-membranous mass, by which it was magnified 230 times, Wöhler found, to his great surprise, that it was almost entirely formed of living infusoria, endowed with motion, and principally of the species *Navicula* and *Galeonella.* It seemed to him at first that the membranes were formed only by these infusoria, but a more attentive examination showed him that the latter were interlaced, and, as it were, studded with extremely fine and colorless filaments of confervæ.

To obtain the silicious skeletons, he separated by filtration a portion of the mucilaginous mass. He washed it with pure water in such a manner as to completely free it from chloride of sodium, and afterwards dried it. It formed a white, lightish mass, similar to paper, which furnished, by dry distillation, ammoniacal, and, consequently, nitrogenous products. It left by combustion in the air, a large quantity of white ashes, from which hydrochloric acid removed a considerable proportion of carbonate of lime; however, this last salt already existed, as the author ascertained by an experiment, in the intact mucilaginous mass, and was evidently precipitated from the saline water. The white earth which remained after the treatment by hydrochloric acid was, as shown by a microscopical examination, formed of silicious skeletons, so perfectly retaining the form of infusoria, that it might be thought that the fresh mucilaginous mass was before the eye. There were then deficient only the points or vascular organs which the living animals contain, and which have the appearance of small bubbles of confined air.

Whence comes the oxygen gas? From the confervæ or from the infusoria? Its great quantity, and the greatly predominating number of the infusoria, would seem to refer the source to the latter; but this would be against all analogy. Or, indeed, should this phenomenon lead to the supposition that those organisms which form the principal mass of these gelatinous membranes, and which we take for animals, are, in fact, plants endowed with motion? But if we must regard them as animals, and the oxygen gas as a product of the vegetation of the confervæ, perhaps the existence of these vegetable and animal organisms, connected by a community of life, and so intimately interlaced, is in a state of mutual independence. Perhaps, as Wöhler thinks, the confervæ live under the influence of light on the carbonic acid very probably produced by the infusoria.

VIREY'S OBJECTIONS TO LIEBIG'S THEORY RELATIVE TO THE USES OF RESPIRATION AND OF FOOD.*

Liebig maintains that the chief use of the food is to supply carbon and hydrogen, which, uniting with the oxygen absorbed from the air, give rise to the generation of animal heat. He consequently holds that there is a certain fixed relation between the amount of food consumed, and the quantity of carbon and hydrogen thrown off at the lungs. M. Virey opposes this theory, as contrary to common observation; as, even though it be allowed to be applicable to mammalia, birds, and reptiles, it is by no means to those animals which respire by means of branchiæ. Thus all animals with branchiæ consume but little oxygen, comparatively speaking, and yet many of them devour very great quantities of food. Even the largest and most voracious of the reptiles, as the alligators, crocodiles, &c., which devour enormous quantities of food, under a burning climate, too, respire feebly with their vascular lungs, and consume but little oxygen.

Fishes, whose blood is but imperfectly oxygenated by the branchial apparatus, are, perhaps, among the most voracious of animals, and yet, according to Liebig's theory, they ought to eat little, because they consume little oxygen.

The same holds true as regards the Mollusca. The cuttle-fish, *buccinum*, *strombus*, *murex*, &c., grow to a large size, but their respiration is very imperfect, and yet they are great flesh-eaters. The Crustacea, again, as crabs, lobsters, &c., grow rapidly, because they are great eaters, but their branchial apparatus is not fitted to consume much oxygen.

In all these animals, assimilation takes place very rapidly, notwithstanding their feeble respiratory powers; and they are, besides, by no means deficient in activity or muscular powers, though their flesh is but feebly azotised or animalised, and their blood is always cold.

If it be one of the characters of vitality, that the more perfect this principle is, the greater is the number of germs, or eggs, or fœtuses produced, then, quite contrary to Liebig's theory, the number of germs produced is in the inverse ratio of the perfection of the respiratory functions. Fishes and mollusca deposit their spawn, or eggs, by millions; but the mammalia, and even the birds, whose respiratory functions are the most perfect, are in this respect infinitely behind these. On the other hand, it is seen that the number of germs, or eggs, is rather proportioned to the nutrition received; for the amount of food taken is not proportioned to the respiration in the animal kingdom.

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* *Journal de Pharmacie*, and *Med. Gaz.*

M. Virey therefore concludes, that the vital force, or central nervous energy, has no more to do with the production of animal heat than the consumption of carbon at the lungs, and this for three special reasons:—1st, Because an impregnated egg resists a freezing temperature longer than one which has not been impregnated. 2nd, That a hybernating insect, reptile or animal, or even trees, during winter, by the sole influence of a vital power, resist a freezing temperature, whereas the same animals, if dead, would be instantly frozen. 3rd, That many mammalia and birds keep themselves warm even in the most rigorous winters under the Pole, not in consequence of a greater amount of oxygen consumed, nor by a greater amount of muscular activity, but, in consequence of a more abundant, highly nitrogenous, or animal nourishment.

PURIFICATION OF THE HYDROCHLORIC ACID OF COMMERCE.*

BY M. LEMBERT.

The following is the process which I use for purifying the hydrochloric acid of commerce. This process is cheap, and requires but little time, so that manufacturers who wish to employ it will be able to sell chemically pure hydrochloric acid, at a cost little exceeding that of the ordinary acid.

If the acid to be purified contain sulphurous acid, which is most commonly the case, I add to it a little binoxide of manganese, the oxygen of which converts the sulphurous acid into sulphuric. But as it is almost impossible by this means to avoid the formation of a little chlorine, I add to it a little protochloride of iron, or even a little iron turnings or filings, to absorb the free chlorine.†

I put a certain quantity of the acid into a tubulated retort, and adapt an S tube to the tubulure, and to the beak a Woulfe's apparatus, the bottles of which contain distilled water, and are surrounded with cold water.‡

The apparatus being thus arranged, I pour by the S tube a quantity of sulphuric acid at 66°, double that of the hydrochloric acid. For that purpose I use a funnel drawn to a fine point, solidly fixed over the tube, and on which I place a flask containing sulphuric acid. The sulphuric acid seizes the water, and disengages the gas, which is then dissolved in the water of the flasks.

It is important to employ concentrated hydrochloric acid; without this precaution, gaseous hydrochloric acid is not immediately disengaged, and it is less easy to obtain all.

When all the sulphuric acid has been added, the liquid is gradually carried to ebullition; at this point it contains no hydrochloric acid. The following are the results of two operations:—

EXPERIMENT I.

	Kil.
Hydrochloric acid at 20° . . .	2·000
Sulphuric acid at 66° . . .	4·000

The liquid was heated, and the gas was not immediately disengaged.* By the addition of the sulphuric acid, I obtained:—

	Kil.
Hydrochloric acid at 20° .	1·570
Then by heating the liquid:—	
Hydrochloric acid at 19° .	0·350
Total	1·920

of hydrochloric acid almost at the same degree with scarcely $\frac{1}{20}$ loss; the remaining liquid perceptibly contained hydrochloric acid.†

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* *Journal de Pharmacie*, March, 1843.

† If iron filings be employed, care must be taken that they do not contain copper, which would react on the sulphuric acid, and would cause it to return to the state of sulphurous acid.

‡ I do not put water into the first flask, because at the end of the operation a little acid water is distilled over, and even pure water, if the operation be carried too far.

* It is understood, that when the hydrochloric acid is sufficiently concentrated, there is no disengagement of heat: indeed, if, on one hand, there be an emission of caloric, by the combination of the water with sulphuric acid, there is also an absorption of that fluid by the *gazeïfication* of the hydrochloric acid.

† In these two experiments, I avoided carrying the liquid to ebullition, in order to have as little steam as possible condensed in the empty bottle; but in several preceding experiments, I boiled the liquid, which did not then retain the slightest trace of hydrochloric acid, especially when I employed it at 22°; when I used it at 20°, it was necessary to maintain the ebullition for some time; besides, the concentration of hydrochloric acid might be supplied by a greater quantity of sulphuric acid.

EXPERIMENT II.

	Kil.
Hydrochloric acid at 22° .	2·000
Sulphuric acid at 66° . .	4·000

The liquid was scarcely heated, when the gas was immediately disengaged. By the addition of sulphuric acid I obtained:—

	Kil.
Hydrochloric acid at 22° .	1·700

Then by heating the liquid:—

Hydrochloric acid at 21·5°	0·290
Total	1·990

of hydrochloric acid almost at the same degree minus $\frac{1}{40}$ of loss; the remaining liquid marked 56°, and retained a very small quantity of hydrochloric acid. Thus obtained, the hydrochloric acid is chemically pure,* and, as is evident in this operation, the expenses are reduced to the concentration of the acid, which, brought from 56° to 66° may serve for another experiment, and even for the less delicate operations of industry and of the laboratory.† It might also be used in many cases as it is, that is to say, at 56°. Finally, a manufacturer of products, who would purify hydrochloric acid by this means, would not require to heat it to obtain the last portions of gaseous acid, because the weak sulphuric acid containing hydrochloric acid may be employed in the preparation of the latter.

ANALYTICAL EXAMINATION OF MATTERS PASSED IN THE DIARRHŒA OF INFANTS.‡

BY DR. LANDERER.

Dr. Landerer found that the liquid constituting the alvine evacuations, in this disease, is formed of the following substances:—

Phosphate of lime	2·00
Carbonate of lime . , .	1·50
Chloride of calcium . . .	1·00
Chloride of magnesium . .	2·45
Chloride of sodium . . .	2·43
Sulphate of lime	1·50
Sulphate of soda	0·80
Bitter principle of the bile.	
Fatty matter soluble in ether.	
Extractive principle soluble in water	3·00
Extractive principle soluble in alcohol	1·00
Free lactic and hydrochloric acids .	1·00

In another case, the same chemist found these matters composed of free lactic and acetic acids, of lactate and acetate of lime, lactate of soda, sugar, albumen, bitter principle of the bile, sulphates and chlorides, and carbonate and phosphate of lime. The saccharine principle probably arose from some of the medicines which had been taken.

MEANS OF DETECTING TRACES OF SULPHUROUS ACID IN HYDROCHLORIC ACID.*

BY M. LEMBERT.

Among the impurities which render hydrochloric acid unfit to be employed as a reagent, or means of analysis, sulphurous acid occupies a conspicuous place. It is needless to say how important it is to recognise its presence; the means which I employ detects the smallest quantities of it. It shows its presence even when protochloride of tin is incapable of doing so.

For this purpose, I saturate a little of the acid to be tested, by carbonate of potassa.† I add to it a small quantity of weak solution of starch, and one or two drops of iodate of potassa or soda, then, concentrated sulphuric acid which liberates the sulphurous and iodic acids, which react on each other; iodine is set free, and the liquor turns blue.

It is necessary to be careful to add the sulphuric acid only in very small quantities; a fresh drop must not be added until it has been ascertained that the preceding one has not colored the liquid.

ON THE EMPLOYMENT OF THE FERRO-CYANURET OF POTASSIUM AS A REAGENT.‡

BY M. A. LEVOL.

The protocyanuret of iron and potassium so frequently employed as a reagent, because it unites to a high degree of sensibility, the advantage of producing, with most metallic salts, various colored precipitates, has, however, a real inconvenience caused by its instability in the presence of liquids possessing an acid reaction; it is known that it then forms, by rapidly decomposing under this influence, a precipitate of prussian blue, tending to indicate the presence of iron in liquids containing not a trace of it, or at least to disguise the tint of the precipitate, the manifestation of which is sought for. To avoid this inconvenience, it is generally difficult to have recourse to a previous neutralisation of the liquid to be tested, because the acid reaction is inherent in most of the metallic salts, and cannot be destroyed without their being decomposed; we are therefore commonly contented, in such a case, with adding sufficient water to prevent the alteration of the double cyanuret from taking place, immediately, at least, and, indeed, nothing better can be done when it is required to determine the presence of certain metals by means of this reagent; but for those whose salts are capable of forming with ammonia double combinations, soluble in water, as copper, nickel, cobalt, &c., it is infinitely preferable to treat the more or less acid solutions in which they are suspected to exist, by the solution of ferro-cyanuret of potassium to which ammonia has been added, then, to saturate the alkali, by means of a weak acid. The following is what occurs in this case:—The ferro-cyanurets of the metals, of which I speak, being soluble in ammonia, no effect is ordinarily perceived after the addition of the mixed reagent: but towards the limit of neutralisation, the precipitate appears, and, which it is important to notice here, it is then presented under such a flocculent form, that quantities so minute that they might have escaped observation without this artifice, thus become appreciable.

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* If the acid to be purified be arsenical, the first portions alone are pure; and again, it is necessary for it to be concentrated at least to 22°, in order to avoid the disengagement of heat, by the addition of sulphuric acid. This result is due to the extreme volatility of the chloride of arsenic, which, as Dr. Dupasquier has demonstrated, renders arsenical the hydrochloric acid prepared with the sulphuric acid obtained at Lyons, by the combustion of the pyrites of Chessy. It will be understood, that it will be the same if arsenical sulphuric acid be employed.

† The quantities of iron and manganese which are added, are so minute that they scarcely amount to $\frac{1}{1000}$ of the weight of the sulphuric acid.

‡ Buchner's *Repertorium für die Pharmacie.*

* *Journal de Pharmacie et de Chimie*, March, 1843.

† It should not be saturated with carbonate of soda of commerce, for if pure hydrochloric acid be saturated with it, the liquor, treated as above, will turn blue by the addition of sulphuric acid.

‡ *Journal de Pharmacie*, March, 1843.

In order to give an idea of it, I will detail some comparative results, obtained with sulphate of copper.

The chemists who have numerically indicated the sensibility of reagents, have considerably differed relative to that which they assign to the same body; thus, for example, as regards copper in particular, with respect to the ferro-cyanuret of potassium, Berzelius gives as a limit $\frac{1}{60000}$, Lassaigne $\frac{1}{2000000}$, and Harting about $\frac{1}{80000}$;* it is evident that differences apparently so considerable, but turning in reality on extremely small fractional numbers, may be quite naturally explained; for it is evident that, supposing even a perfect identity of circumstances, these limits and the sensibility of the eye of the observer are no less always correlative; it is, then, only in order better to profit by the advantage presented by the means proposed in this note that I thought it necessary to make comparative experiments, some in the common way, with the ferro-cyanuret alone, and others with the same salt, to which ammonia has been added. It resulted from these experiments, made with the utmost precision, that to have an *immediate effect* with the ferro-cyanuret of potassium alone, the liquor tested must contain at least $\frac{1}{130000}$ of copper; but by operating as I propose, that is to say with the addition of ammonia, $\frac{1}{300000}$ *immediately* manifested itself, and $\frac{1}{500000}$, became perceptible at the end of 18 hours, for after that time there was at the bottom of the glass a precipitate perfectly recognisable by its crimson-brown color.

To obtain the mixed reagent, in the state which appeared to me most convenient for this purpose, I added one volume of ordidary caustic ammonia, to three volumes of an aqueous solution of ferro-cyanuret of potassium, half saturated without heat, that is to say, containing nearly 11 per cent. of this salt.

It is convenient to pour into the liquid to be examined, sufficient of this mixture for the excess of ammonia to become sensible to the smell, then to saturate or even to slightly supersaturate, by means of acetic acid, added drop by drop, stirring the liquid all the time with a glass rod. This test is very rapid, especially in cases where the liquor examined contains much of the metal sought for, because its ferro-cyanuret begins to be precipitated as soon as the term of the saturation of the alkali approaches.

ANALYSIS OF A PERITONEAL EXSUDATION.*

BY DR. WOLF.

This exsudation, which presented the appearance of a dirty, turbid, yellowish-white fluid, of a disagreeable animal odor, was analysed by Dr. Wolf, who found it composed as follows, in 100 parts:—

Water, with traces of free acetic acid	91·9875
Albumen	5·9333
Caseum	0·3300
Osmazome	0·0317
Matter analogous to saliva	0·2767

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* I say about, because I have before me only some extracts from the work of this last chemist, and because the ciphers which express this limit, do not agree in his work

* *Medecinisches Jahrbuch des Oestereichisches Staats.*

Fat	0·0317
Fatty matter analogous to cholesterine	0·0133
Lactate of soda	0·1867
Lactate or acetate of magnesia	0·0629
Albuminate of soda	0·0030
Chloride of sodium	0·6780
Carbonate of soda	0·1416
Sulphate of potassa	1·0161
Phosphate of soda	0·0153
Phosphate of lime mixed with oxide of iron	0·0113
Carbonate of lime	0·0262
Loss	0·0757

ANALYSIS OF THE LIQUID CONSTITUTING A HYDRENCEPHALOUS SWELLING OF A CHILD.*

By evaporating six ounces of this liquid, Landerer obtained 18 grains of a residue formed of the following substances:—

Chloride of sodium	2·0
Chloride of calcium	1·0
Sulphate of soda	3·0
Phosphate of lime	1·5
Carbonate of lime	1·0
Lactate of soda.	
Fatty matter soluble in ether	2·5
Osmazome	1·0
Albumen	2·0
Lactic acid	2·0
Carbonic acid.	

CHEMICAL ANALYSIS OF THE LACHRYMAL FLUID OF A HORSE.†

This fluid is composed, according to Landerer, of water, albumen, chloride of sodium, phosphate of ammonia, carbonates of ammonia and soda, and a yellow liquid which, treated by ether, furnished a yellowish oil, of a disagreeable and amarescent taste.

CHEMICAL EXAMINATION OF A FLUID OF A HYDRORACHIS.*

This fluid, furnished by a child aged seven months, was composed of water, albumen, soda, lime, magnesia, and ammonia, with traces of lactic and phosphoric acids.

Several weeks afterwards, the fluid furnished by the same subject, presented to Landerer, albumen, soda, chloride of sodium and a little chloride of calcium, chloride of magnesium, and traces of phosphate of soda, phosphate of ammonia, lactates of soda and ammonia.

CHEMICAL EXAMINATION OF A FLUID EXTRACTED IN A CASE OF PARACENTESIS.*

This fluid, which at first presented the brown tint of coffee, afterwards offered a color verging on yellow; it was neutral at the commencement, but it finally acquired an alkaline reaction; it had the odor of broth; its taste was insipid, sweetish, then rather bitter. Landerer found it composed of water, fatty matter analogous to cholesterine, albumen, sulphate of soda, and chlorides of sodium, calcium and magnesium.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

IMPROVEMENT IN THE PROCESS OF MANUFACTURING LIME, CEMENT, ARTIFICIAL STONE, AND SUCH OTHER COMPOSITIONS, MORE PARTICULARLY ADAPTED TO WORKING UNDER WATER, AND TO THE CONSTRUCTION OF BUILDINGS AND OTHER WORKS WHICH ARE EXPOSED TO DAMP.‡

PATENT GRANTED TO MR. W. E. NEWTON, OF THE OFFICE FOR PATENTS, CHANCERY LANE.

This invention, communicated by a certain foreigner residing abroad, consists, Firstly,—in the formation, by certain new processes, of an hydraulic lime and cement, which has the property of becoming hard and solid, when under water, or exposed in damp situations. Secondly,—in the application of the same principles to the hardening of soft stones, for the purpose of making hard artificial stones. Thirdly,—in the employment of the same process for hardening wood, and preserving iron from the effects of damp, &c.

The following is the principle upon which the invention is founded, and the methods employed for carrying it into effect:—The property which certain sorts of lime possess, of being hydraulic, or hardening under water, is caused by a certain combination of the lime with silica, alumina, and sometimes, also, with oxide of manganese and oxide of iron. The object then of this invention, is to facilitate the combination of the lime with those oxides, by means of agents not hitherto employed. Thus, in operating by the dry method, as is generally the case, instead of calcining the limestone, or lime, with sand and clay, the inventor, in order to facilitate the combination of the silica and alumina with the lime, introduces a small quantity of potassa or soda, in the state of carbonate, sulphate, or chloride, or of any other salt of these bases, susceptible of decomposition, or becoming a silicate,—when such calcination takes place. The salt of potassa or soda, the quantity of which varies from three to six per cent. to the quantity of lime, is employed in the state of solution, so as to penetrate and mix better with the alkaline salt in the chalk or slaked lime. Calcination effects the rest, in the ordinary manner.

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* Buchner's *Repertorium.*

† *Ibid.*

‡ *Lond. Journ. and Repertory of Arts*, May, 1843.

* Buchner's *Repertorium.*

† *Ibid.*

In order to combine or incorporate more equally, by the dry method, the alumina, and the oxides of manganese, and of iron, with the lime, the sulphates of these bases are first decomposed by the slaked lime, by making a paste with a solution of the sulphates, mixed with the lime. This paste, into which the sulphates in question enter, in the proportion of from six to ten per cent. of the lime, is then calcined, in order to produce an hydraulic lime. All sorts of lime are made hydraulic, by the humid method, by mixing slaked lime with solutions of alum or sulphates of alumina; but the best method consists in employing a solution of the silicates of potassa, or of soda, called liquor of flints, or soluble glass. An hydraulic cement may also be made, which will serve for the manufacture of architectural ornaments, by making a paste of pulverised chalk, and a solution of the silicate of potassa or soda; in working with this plaster, it becomes much harder than ordinary plaster.

These same silicates of potassa or soda, dissolved in water, will also harden chalk, or soft and porous stones, and transform them, artificially, into hard stones. In order to do this, these soft stones, either rough, or cut into their proper forms, must be soaked in a solution of the silicate, either warm or cold, and allowed to remain there a longer or shorter time, according to the degree of hardness which it may be necessary to give them; after which, they must be taken out, and left exposed to the air. At the end of a few days, stones thus prepared will have acquired a hardness equal to that of marble; and this quality, in a little time, pervades the whole mass; for if, for the purpose of polishing, the outer coat or surface be removed, the inner one, which at first is not so hard, will harden in its turn, by exposure to the air. This takes place as far as the silicate has been able to penetrate. A more superficial hardness is obtained by applying the solution of the silicate of potassa or soda, by means of a brush. It is in this manner that walls, constructed of chalk and mortar, may be hardened. Sculpture and various other objects, which may be made or prepared in chalk, may be hardened, and afterwards serve for decorating buildings, and other purposes, without the fear of their becoming injured by frost or damp. Chalk, hardened in this manner, may also be used as a substitute for the stones now employed by lithographers. Plaster models may also be hardened, by placing them, for some time, in a solution of the silicate; but it would be still better to add a portion of the solution to the paste, at the time of making the model, or using the plaster. The silicate of potassa or soda is prepared by fusing one part of white silicious matter, with from one and a half to two parts of potassa or soda, in the ordinary reverberatory furnaces, or in a glassmaker's or iron crucible. The solutions may be used of any density for plaster; but they should be weaker for chalk. In the last place, the inventor has found that the silicate of potassa or soda, when dissolved in water, decompose spontaneously in the air, and cover the objects, to which their solution has been applied, with a strong covering or layer; therefore, by applying the solution of silicate of potassa or soda to polished iron, and allowing it to dry in the air, the metal is preserved from oxidation. By soaking wood many times in this solution, and allowing it to dry in the open air, every time after it has been placed therein, it becomes so much penetrated with silica, that it acquires a considerable density and degree of indestructibility.

The solution of silicate of potassa is not the only substance which, by being injected into porous bodies, tends to harden them. A mixture, made from a solution of bicarbonate of ammonia, and of chloride of magnesium, may be successfully employed; or a mixture of the solutions of ammonia and chloride of calcium may be used. In these latter cases, instead of having silicious injections, they are either magnesian or calcareous. Soft and porous stones may also be considerably hardened, and defended from the action of damp, by first well drying them, and then dipping or steeping them in sulphur, or some natural or artificial resinous or bituminous substance, rendered liquid by heat.

The patentee claims,—Firstly, the appliaction of certain new means to change or convert all descriptions of lime into hydraulic limes and cements, or such as become hard under water, or when exposed in damp situations, by combining these limes and cements with silica, alumina, the oxide of manganese, or the oxide of iron, either by the dry or humid method. Secondly,—the manufacture of hard artificial stones from chalk-plaster and all porous stones in general, by injecting into them, or imbuing them with, silica, or the carbonates of magnesia and lime, by any of the above-described processes; or by causing them, by virtue of their porous nature, to absorb either melted sulphur, or bituminous, resinous, or fatty matters, properly liquefied by means of heat. Thirdly,—in the employment of the silicates of potassa or soda, for making or forming a stony plaster or coating, upon a variety of substances; thereby preventing iron from becoming rusty or oxidised, and rendering wood and other organic matters harder, and not liable to decay.

IMPROVEMENTS IN DYEING WOOL, WOOLLEN CLOTHS, COTTON, SILKS, AND OTHER FABRICS AND MATERIALS.*

BY PETER KAGENBUSCH.

This improvement consists in producing a mordant, to be used for fixing the color in cloths, silks, &c., by operating upon the residual mother liquors of alum-works; that is to say, the mother liquor of the alum meal, rough alum, or alum for rocking, from which the Epsom salts have been taken in one or more crops. The patentee uses the residual mother liquor of that manufacture in which muriate of potassa has been employed for the alkaline base, in preference to the mother liquor of that wherein sulphates are used; and he also prefers the liquor of the alum from the natural rock or schist, to the mother liquor of the rough alum, from what is generally termed the "artificial alum process."

The method of operating upon the residual mother liquor is as follows:—A solution of common salt or brine is added to the mother liquor, when boiling, for the purpose of neutralising the sulphuric acid contained in it; the quantity of brine to be added depends entirely upon the amount of sulphuric acid in the liquor; but in general, a saturated solution of salt, equal in quantity to about one twelfth of the mother liquor, will be found sufficient. The liquor is now ready to be used for dyeing all colors, with the exception of red; and, if not sufficiently strong, it may be brought to the required strength by continued boiling and evaporation.

When the above product or mordant is to be conveyed from one place to another, it is to be boiled until sufficiently concentrated, and is then allowed to crystallise; the crystallised substance should be protected from the action of the atmosphere, and, when required for use, it is to be dissolved in water. In some cases, the solution of salt is added to the mother liquor, previous to taking the last crop of Epsom salts; that is, when boiling up for the last crop; when the salts have been removed, in the usual manner, the residual liquor is ready for use as a mordant.

The patentee claims the improvement in dyeing, by the use and application of the residual mother liquors of the alum works, and of the product obtained therefrom, as a mordant, as above described.

ON THE FIXATION OF IRON MORDANTS ON CALICO.*

BY HEINRICH SCHLUMBERGER.

The author of this Memoir has examined the circumstances which are most favorable for the fixation of the iron mordant on calico.

1. The nature of the solution of iron, and the state of oxidation in which it exists in the mordant:

2. The nature of the thickening of the mordant:

3. The state of viscosity of the thickened mordant:

4. The addition of various substances to the ferruginous mordants:

5. The oxidising action of the air on the mordant during the impression:

6. The hygrometric action of the air during the impression:

7. The drying of the mordants printed on the cloth:

8. The rest of the pieces after being printed:

9. The cleansing or dunging of the printed pieces.

Afterwards follow the accidental causes which may be produced in the operations of dyeing, and from the brightening of the ferruginous mordants:—

1. The iron mordants most generally employed for dyeing black, puce, and violet, are the acetate and pyrolignite of iron. These solutions should be in the state of protoxide. When they are oxidised, either by the contact of the air, or by any other

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* *Lond. Journal and Repertory of Arts*, May, 1843.

* *Revue Scientifique et Industrielle.*

cause, the fixation of the oxide on the stuff is but imperfectly effected.

Pyrolignite of iron, on account of the pyrogenous oils which it contains, is more easily preserved in the state of protoxide than the acetate. Hence the preference given to it in many cases.

The author has demonstrated that various aceto-ferruginous solutions might be employed with as much success as the pyrolignite of iron.

After having prepared the mordant for puce, composed of acetate of alumina and iron, the mordant for violet is prepared with the following solutions :—

1. Acetate of iron obtained by the double decomposition of protosulphate of iron and acetate of lead.
2. Acetate of iron prepared by acetic acid and metallic iron.
3. Acetate of iron obtained by iron and the red vinegar of Burgundy.
4. Purified pyrolignite of iron, prepared with pure pyroligneous acid.
5. Purified pyrolignite of iron, boiled for five minutes.
6. Crude pyrolignite of iron, containing a great excess of tar, prepared with metallic iron.
7. Mixture of crude and purified pyrolignite of iron.

These different solutions were diluted with water, and brought to the same areometric degree, and then thickened, one portion with starch and the other with gum of starch, in order to be printed on calico. After two days' repose, half of the samples were passed into the cowdung bath; the other half remained ten days after printing. After the dyeing and the brightening, no difference in the result was observed.

Schlumberger concludes from these different experiments, that whatever aceto-ferruginous solution is employed, it will produce a good result if used in the state of protoxide of iron, when applied to the cloth. It is difficult, however, to decide on the employment of any one of these solutions, since everything depends on the kind of preservation followed in the establishments. In the impression of the plate, where the mordants remain for a longer or shorter period in contact with the air in the frame, he prefers pyrolignite of iron. In printing with the cylinder in which the stuffs are cleansed, a short time after printing, pure acetate of iron should be preferred as oxidising most rapidly.

For printing violet with the cylinder, we have used an aceto-ferruginous mordant, composed of 100 parts of protosulphate of iron, 9 of deutosulphate of copper decomposed by 124 parts of pyrolignite of lead; the pyrolignite of lead contained a large proportion of pyrogenous oil.

The nature of the thickening exerts a perceptible influence on the results. Starch, in equal circumstances, fixes more of the mordant on the linen than the gum of starch, and the latter more than gum Senegal.

The viscosity of the thickening likewise exerts a very marked influence on the results: a too thick color imperfectly combines with the tissues, and it is almost impossible to lay down certain rules in this respect. All depends on the kind of design and printing.

Among the substances which may be added to the baths of iron in the preparation of violets, Schlumberger gives the preference to the salts of copper, and in some instances to sugar syrup.

We have used with advantage a mordant composed of pyrolignite of iron previously boiled with iron filings and powdered charcoal, then filtered over iron turnings; this pyrolignite of iron abandons much pyrogenous oil. Suitably diluted with water, and mixed with a small quantity of acetate of alumina and acetate of copper thickened with gum serving for very delicate lilacs, it took a very bright rose tone in the brightening.

After having examined the hygrometric action of air in the workshops during the printing of the iron mordants, it results that the air should always be maintained at a certain degree of humidity; too great dryness injures the combination of the mordant with the stuff. It is necessary, however, that the solution should not be too long, for the acetic acid being retained between the superficial layer of gum and the stuff, cannot be again disengaged, and the combination can no longer be effected. After having examined the effects produced by a too low or a too high oxidation, the author of this Memoir concludes that the iron should be in a degree of oxidation intermediate between the protoxide and the peroxide, after the operation of dunging. This supposition is so much the more probable as the same phenomenon is remarked in dyeing wool black. Experiments made with the view of attaining the degree of heat necessary for the cleansing of iron mordants in the cowdung baths, gave a temperature of 60° C. It is a well proved fact, that acidity should be avoided in the dung-bath, as the acetic acid would act as a solvent of the mordant combined with the cloth. The addition of chalk not only gets rid of this inconvenience, but also aids in the fixation of the iron mordant on the cloth.

The author has demonstrated that weak

iron mordants do not exert a destructive action on cloths when they are at a low degree. At 15° Beaumé, the alteration of the cloth takes place with aceto-ferruginous mordants: this alteration is less perceptible with the pyrolignite of iron than with the pure acetates or those obtained by double decomposition; that the stuffs printed with mordants become weaker as the oxidation is more rapid: that under the influence of the solar rays, the alteration is more rapid than by exposure to heat in a dark place; that thickened mordants weaken less than those which are not thickened; finally, that a cleansing in a boiling dung-bath also causes alteration of the tissues.

Without deciding, however, the alteration of the tissues is attributed rather to the effects which accompany or follow the combination of the protoxide of iron with oxygen to produce the peroxide.

INVESTIGATIONS CONCERNING THE FATTENING OF CATTLE AND THE FORMATION OF MILK.*

BY MM. DUMAS, BOUSSINGAULT AND PAYEN.

(*Concluded from* p. 216.)

PERHAPS, but always within certain limits, the proportion of butter in milk, and its nature also, might be varied at will. In order to prove it, for example, would it not be sufficient to call to mind that the butter of cows of the same locality may vary, to a certain extent, according to whether they are fed on green provender or with dry food; and that the butter of Vosges contains, for example, 66 of margarine to 100 of oleïne in summer, and 186 of margarine to 100 of oleïne in winter. In the first case, the cows feed on the mountain; in the second, they eat dry food in the stable.

But, doubtless, a direct experiment in this respect, and which appears to us conclusive, will be preferred; if half of the ration of hay of a cow be substituted by an equivalent quantity of rape cake, still rich in oil, the cows are maintained in good condition, but the milk furnishes a more fluid butter, and this butter possesses, to an intolerable extent, the taste of rape oil.

What is opposed to this experiment of one of us? and how can it be otherwise than concluded, that the fatty matter of the food passes into the milk, with little or no alteration, in order to form butter?

Let an intelligent agriculturist, guided by suitable chemical studies, take up these ideas, and we doubt not that he will soon be able to modify, at pleasure, the quantity and taste of his products, by judicious modifications in the nature of the food furnished to his flocks.

Is that which we have above said of the experiment made, by one of us, on seven cows, applicable to the generality of cases? We hesitate not to affirm that it is.

It results, indeed, from all that we have observed, that by causing cows to eat 100 kilogrammes of hay, dry clover, and aftergrass, and their equivalent of green food, 42 litres of milk, on the average, are obtained.

It is found, likewise, on the average, that 28 litres of milk contain and furnish one kilogramme of butter.

Whence it follows that 100 kilogrammes of dry hay would produce $1^{\text{kil}}\cdot50$ of butter.

Now, analysis indicates in dry hay a quantity of fatty matter, amounting to $1^{\text{kil}}\cdot375$, or 2 per cent.; consequently, a greater proportion than that contained in the milk which it furnishes, and at the same time capable of representing that which is found in the excrements of the animal.

An agricultural writer, Riedesel, who has attentively studied this subject, presents the results in another fashion, namely, by dividing the aliment of the cow into two parts, distinguishing the quantity required for support from that which serves for the formation of milk.

According to him, a cow, weighing 600 kilog., would require 10 kilog. of dry hay for its ration of support. With this regimen, therefore, it could not produce milk without becoming thin.

But for every kil. of hay that the cow eats beyond the 10 kilog. necessary for its support, it furnishes 1 kilog. of milk; so that by eating 20 kilog. of hay, such a cow might furnish 10 litres of milk.

These results agree with our own observations, but they require another interpretation.

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* *Comptes Rendus*, No. 7, 1843.

(1) Numerous facts, worthy of serious attention, have taught us that green forages are in general more profitable than dry ones in the production of milk, and in the fattening of animals; it would be curious, without doubt, to determine the circumstances favorable to this more complete assimilation, and its precise effects.

Here is a subject for very interesting investigations; if we had been able to enter upon it, we should have wished to reconcile the results of these comparative alimentary regimens, with the remarkable facts observed by M. Magendie, and which have developed such notable differences between the nutritive powers of cooked meats and raw flesh.

But such studies might have carried us too far; we preferred keeping to the plan which we had fixed upon, leaving to other experimenters the task of settling those questions, without, however, entirely renouncing all attention to them ourselves.

Thus, it would be wrong to admit, in our opinion, that a cow can extract 10 litres of milk from 10 kilog. of dry hay.

That appears to us impossible, because 10 litres of milk contain 0^{kil}·370 of butter, whilst 10 kilog. of dry hay contain only 0^{kil}·187 of fatty matters.

Besides, things do not occur thus. When a cow eats only 10 kilog. of dry hay, it consumes all the products which it can extract from it, whether they be nitrogenous, fatty or saccharine. But, when 20 kilog. of dry hay are furnished to it, it finds therein saccharine or analogous products, in sufficient quantity for its daily ration, and there is nothing to prevent it from putting in reserve, under the form of milk, a portion of those saccharine products, a portion of the nitrogenous matters, and almost all the fatty matter.

Moreover, it is known that, from the time that the cow fattens, the ration remaining the same, the milk diminishes in proportion to the increase of weight of the animals, and in a ratio which we shall very soon determine with precision.

Like all animals, the cow must daily produce a given quantity of heat, and it certainly developes it by means of the soluble products contained in its blood, before attacking the insoluble products, such as the neutral fatty bodies which the chyle incessantly pours into it.

Thus, with the small ration of 10 kilog. a cow consumes all that it absorbs; when it eats 20 kilog., it makes a selection, consuming certain products, reserving others, and then it finds the 0^{kil}·370 of butter, which its milk contains, in the hay which it has received, and in which analysis indicates, in fact, at least 0^{kil}·370, and even 0^{kil}·400 of fatty matter.

But if it be true that hay contains sufficient fatty matter to represent the butter which exists in the milk furnished by the animal fed with it, will the same result be found when the cow is nourished with food of another nature?

The answer will be easy, thanks to the information which we owe to the carefulness of M. Damoiseau, one of the most attentive observers who have paid attention to the production of milk, and who has carried the strictness of scientific methods into the consideration of all the phenomena which he had to study in his fine establishment.

	EQUIVALENT RATIONS FOR A COW.				
	I.	II.		III.	
Beet-roots	40 kil.	Carrots	34 kil.	Potatoes	25 kil.
White pollard	3		3		3
Bran	2·5		2·5		2·5
Luzerne	3		3		3
Oat straw	6		6		6
Salt	0·05		0·05		0·05
	54·55		48·55		39·55
Produce in milk and cream	Maximum.		Mean.		Minimum.

In order to seize the true sense of these expressions, we must add that the minimum of milk being about 7 litres per day, the mean amounts to 9 or 10, and the maximum to 15.*

	EQUIVALENT RATIONS FOR AN ASS.					RATION FOR A GOAT.	
	Kil.		Kil.		Kil.		Kil.
Beet-roots	14·000	Carrots	11·900	Potatoes	8·744	Beet-roots	5·900
White pollard	1·050		1·050		1·050		0·500
Bran	0·955		0·955		0·955		0·460
Luzerne	1·050		1·050		1·050		0·500
Oat straw	2·100		2·100		2·100		1·000
Salt	0·020		0·020		0·020		0·010
	19·175		17·075		13·919		8·370
Produce in milk and cream	Maximum.		Mean.		Minimum.		Maximum.

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* The cow-keepers who supply Paris, and in general in large towns, rid themselves of cows which, from beginning to fatten, or from other causes, yield little milk; from this it results that the mean of the production of milk is raised in those localities.

By taking the solid equivalents of potatoes, carrots, and beet-roots, it is again evident, from experiments made on asses, that the potatoes furnish least milk, the same as has been observed with respect to cows.

Let us now calculate the real value of these different aliments, and take as an example the regimen of beet-root. It is composed of 14^{kil}·55 of bran, luzerne, and straw, which seems destined only to scour the stomach of the animal, as, indeed, it is generally thought. Chemical analysis will very soon teach us what to think of this opinion.

Oat straw contains not less than 5 per cent. of resinoïd fatty matter; luzerne contains 3·5 per cent; bran, 5 per cent.

Whence it follows that there enters into the regimen of a milch cow in the establishment of M. Damoiseau :—

	At per cent.	Of fatty matter.
5^{kil}·0 Pollard and Bran	5	0^{k}·275
3 ·0 Luzerne	3	0 ·090
6 ·0 Oat straw	4	0 ·240
		0 ·605

There are then 600 grammes of fatty matter, a quantity more than sufficient for producing not only 10 litres of milk, but even 15 litres of milk, very rich in cream, quantities containing from 400 to 550 grammes of butter.

If the cow likewise receives 40 kilogrammes of beet-root, it finds, in this new aliment, 6 kilogrammes of solid matter formed of sugar which it burns, 20 grammes of fatty matter which may pass into the butter, and nitrogenous matters which may be converted into caseïn.

The water of the beet-root is besides far from useless; it is necessary to the production of milk as well as to the different functions of the life of the animal.

When 25 kilogrammes of potatoes are given to a cow, it is still 6 kilog. of dry matter that it receives. This matter also contains 20 grammes of fatty substance associated with much starch, which may be converted into sugar, and with albuminoïd matters which interfere in digestion. The reason that the potato furnishes less milk than beet-root, is, doubtless, because it contains less water.

According to analysis, it should require nearly 33 kilog. of carrots to represent 40 kilog. of beet-roots; but the regimen of carrots is determined by other considerations than those which relate to the economical production of milk.*

From this discussion it results, that instead of 20 kilogr. of dry hay, which a cow would receive, 14 kilog. of oat straw, bran, or luzerne, may be given to it, and 6 kilog. of dried beet-roots or potatoes : in all 20 kilog.

In this last regimen, the beet-roots or potatoes constitute the ration of support, and sustain the life of the animal by their sugar or their starch. It is the oat straw, the bran and luzerne, which furnish, on the contrary, the greater portions of the fatty matters necessary for the formation of milk.

If we now try to pass to the phenomena of the fattening of animals, we find so exact an application of the principles which we have laid down, that if there remain some few circumstances to be cleared up, we hope that they speedily will be explained by the agriculturists, who will hasten to devote themselves to the experiments necessary for controlling views which are of such interest to them.

Setting out from the numbers resulting from Riedesel's experiments, which agree, in some points, with the information which we have gained, the following results are arrived at :—

According to Riedesel, it would be found that an ox, weighing 600 kilog., retains its weight when it eats 10 kilog. of dry hay per day. To fatten, the same ox would require, for its complete nourishment, 20 kilog. of dry hay per day, and it might gain 1 kilog. in weight under the influence of such a diet.

Although regarding the experiments of Riedesel as presenting too favorable results, as giving the maximum of the nutritive power of hay or its equivalents, we admit, with this agriculturist, that 10 kilog. of hay may produce about 10 litres of milk, or about 1 kilog. of beef; it remains to be known what is that 1 kilog. of augmentation in the weight of an ox.

Now, the following is the manner in which this kilog. may be supposed to be disposed of. Admitting that the fatty matter of hay is fixed by the animal, the same as it passes into the milk of the cow, it is found that the ox has received about 0^{kil}·370 of fat. There remains, therefore, 0^{kil}·630 of humid meat, which should contain about 0^{kil}·160 of dry meat.

Whence it follows that the ox which is fattening, supposing even that it can fix in its tissues all the fatty substance of the hay which it eats, derives only half its nourishment, at the most, from the nitrogenous matter which would be extracted by the cow under the form of milk, and that it loses the whole of the alimentary product which the cow converts into sugar of milk.

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* This alimentation is reserved for cows which do not yield much milk, in which it is desired to lower the richness of the milk, in order to substitute by this product, the milk of women. It will be understood that it is proposed thus to avoid a too rapid transition when the milk of a nurse is failing.

It is not necessary to recur to this discussion, to show how great is the difference between the cow and the ox, as regards the portion which they extract for the profit of man, from the food which they have received. Indeed, in this example, which we borrow from Riedesel, in order to fix the ideas, the cow which has consumed 10 kilog. of hay beyond its ration of support, furnishes 10 litres of milk, which represent $1^{\text{kil}}\cdot4$ of dry matter, whilst the ox has increased only 1 kilog. with the same food; and in this kilog. the water fixed in the tissues of the animal certainly amounts to half; whence it follows that it would be exaggeration to suppose that the ox had fixed $0^{\text{kil}}\cdot500$ of dry matter in feeding on the aliment which had furnished $1^{\text{kil}}\cdot400$ to the milk of the cow.

The milch cow, therefore, extracts, for the profit of man, from the same pasturage, a quantity of alimentary matter more than double that derived by the fattening ox. It must be evident, then, that everything tending to establish the commerce of milk on a basis calculated to inspire confidence and to deserve it, would be in the highest degree worth the attention of an intelligent administration. Whence it would again follow that the more general introduction of Swiss *fruiteries* and *fromageries* would be one of the most essential services that could be rendered to our agriculture, at least in localities in which the consumption of all the milk by man would not be possible.

Let us see, however, if these views agree with general experience, and let us examine whether the relations which we have admitted between the secretion of milk and fattening are confirmed by practice.

The following is a note which we owe to the kindness of M. Yvart; it gives the summary of a longer series of facts :—

"The secretion of milk, says this skilful veterinarian, seems to alternate with the formation of fat.

"When a milch cow fattens, lactation diminishes. The best races remain thin for a long time after calving. In certain English races, the cellular tissue of which is very strongly developed, (the Durham race, for example,) the quantity of milk may be considerable after the calving; but the beast does not delay to fatten; the secretion of milk does not last so long as in the cows of Holland or Flanders.

"The English sows, which form much more fat than those of French race, are rarely such good nurses, that is to say, they give less milk."

If it be admitted that there exists a balance between the formation of milk and that of fat, it is also nearly admitted that the fatty aliments, indispensable to the production of milk, are not the less necessary for the production of the fat of animals.

Are there circumstances in which animals might be fattened with aliments deprived of fat?

We have not met with a single fact calculated to give rise to such a supposition.

A skilful agriculturist has tried, for example, the effect of potatoes in fattening pigs, and he was enabled to fatten them by means of this diet only by adding to them cakes of *creton*, which contain, as is known, a considerable quantity of fatty matter.

Again, we have made experiments on pigs, which seem perfectly conclusive, and from which it results that while two Hampshire pigs, which had eaten 30 kilog. of gluten and 14 kilog. of fecula, had gained only 8 kilog., two others of the same race, age, and weight, which during the same period had eaten 45 kilogr. of the boiled flesh of sheep's heads, containing 12 or 15 per cent. of fat, had gained 16 kilog. However, judging from elementary analysis, these nourishments were equivalent to each other. The first, in fact, represented: dry gluten, 12 kilog. plus 14 kilog. of fecula. The second contained: dry meat, $9^{\text{kil}}\cdot5$, and fat, 7 kilog. Thus, then, the quantities of carbon and nitrogen were even rather greater in the vegetable food; but these two rations differed considerably in this sense, that the animal food contained a quantity of fat equivalent to the fecula of the other.

In a second trial, four pigs, fed with boiled potatoes, carrots, and a little rye, had gained only $53^{\text{kil}}\cdot5$, whilst four other pigs, of the same age and in the same condition, fed with boiled sheep's heads, had gained 103.

We ought even to be struck with this circumstance, that the increase of weight of an animal which is fattening, being considered as represented by 50 per cent. of water, 33·3 of fat, and 16·6 of nitrogenous matter, this consequence is arrived at, that the greater portion of the fat is fixed in the tissue of the animal.

Thus the first pigs had eaten $6^{\text{kil}}\cdot7$ of fat, and had gained $5^{\text{kil}}\cdot2$ from it; the four latter had eaten $8^{\text{kil}}\cdot4$ of fat, and had acquired $6^{\text{kil}}\cdot7$.

We cannot conclude without calling to mind the remarkable experiments by which M. Magendie so well established that the chyle of animals nourished with fat aliments, is itself very rich in fatty matter, and that, under the influence of a nourishment very rich in fat, the animals present that affection of the liver which is designated fat liver (*foie gras*). These facts have had great weight in the discussion which has led us to the opinions which we have just expressed.

To sum up, we find by experiment :—

That hay contains more fatty matter than the milk which it serves to form ; that it is the same with other articles of diet furnished to cows and asses.

That cakes of oleaginous seeds augment the production of butter, but always render it more liquid, and may give it the taste of seed oils, when administered in too large quantity.

That maize possesses a fattening property, determined by the abundance of oil which it contains.

That the most perfect analogy exists between the production of milk, and the fattening of animals, as breeders had foreseen.

That the fattening ox turns to account, however, less fatty or nitrogenous matter than the milch cow ; that the latter by far deserves the preference, in an economical point of view, if it be desired to convert a pasturage into products useful to man.

That potatoes, beet-roots and carrots fatten only inasmuch as they are associated with products containing fatty bodies, as straw, the seeds of cereals, bran, and cakes of oleaginous seeds.

That in equal weight, gluten mixed with fecula, and meat rich in fat, produce a fattening which, as regards the pig, differs in the ratio of 1 to 2.

All these results are so perfectly in accordance with the opinion which regards fatty matters as bodies which pass from the digestive canal into the chyle, thence into the blood, into the milk or the tissues, that it would be difficult for us to express on what fact could be founded the idea, which would consider fatty matters as capable of being formed in animals.

We are perfectly aware that chemistry has arrived at transforming certain bodies, such as amygdalin, into oil of bitter almonds, hydrocyanic acid, &c. : we know that it has been able to convert salicine into oil of queen of the meadow, carbonic acid, &c., and believe that, in peculiar circumstances, certain vegetable matters might furnish fatty bodies to chemistry ; but, hitherto, no phenomenon of the economy of the superior animals has given us any reason for thinking that such fats were of a nature to act apart in their digestion, in the formation of their chyle, in the production of their milk, or in the phenomena which occur during their fattening.

ON MANURES AND THEIR COMPARATIVE VALUES.

BY MM. BOUSSINGAULT AND PAYEN.

(*Continued from p.* 220.)

Trèz.—This sea-sand constitutes the soil of the inclining shores in various localities in the *arrondissement* of Morlaix : it is the same fine sand which is designated by the name of *tangue* or *tanque* (*sea-sand*), on our northern coasts.

Favorable to vegetation, especially when a great portion of the salt with which it is impregnated is removed by washing, it is spread in more considerable quantities than marl ; it should also be employed soon after washing, after its extraction from the sea, for exposure to atmospheric influences diminishes its fertilising properties, when the salt has been removed from it by the rain-water ; this may be conceived from its small equivalent of easily decomposed nitrogenous substances ; this alteration of the organic portion of the manure has caused it to be distinguished by the name of *dead-trèz*. Moreover, the incrustations of calcareous deposits, at first disaggregated in consequence of the alteration of the interposed organic matters, render the substance more unctuous to the touch, or more fat ; then, sometimes carried away after their disaggregation, leave at the surface of the shores the quartzose sand more completely deprived of properties, and still more inert. *Trèz*, more than marl, acts by rendering compact soils lighter ; its granular form allows of its being employed directly in improving marshy soils, in which its calcareous substance, and its organic matter, complete the action of dung. The cultivators of these lands spread as much as 40,000 kilog. of trèz per *hectare* in order to sand the soil, which they keep together by a less abundant sanding ; every three years they follow marshy plants with cereals in quantities sufficient only for the consumption of their families. Their crops are generally remarkably fine.

The following is the analysis of living and dead or fat *tangue* (*sea-sand*), according to M. Vitalis :—

Tangue.	Living.	Dead.
Water . . .	6	3·50
Oxide of iron . .	0·60	1·10
Micaceous sand .	20·30	40·00
Argil . . .	4·00	3·50
Carbonate of lime .	66·00	47·50
Loss . . .	3·10	4·40

Our tables give the proportion of nitrogen contained in it, its strength and its equivalent, which would represent inorganic substance nearly in the proportions of the loss in the above-mentioned compositions.

Black Ashes of Picardy.—Under this

name is sold an earthy, blackish substance, partly formed by the disaggregation of pyritous schists; on some lands, abounding in carbonate of lime, this matter appeared to produce good effects for the meadows; this might be attributed: 1st,—to the sulphate of lime formed by the reaction of the sulphate of iron; 2nd,—to the influence of the small quantity of nitrogenous substance indicated by our analyses; but fatal mistakes have occurred when these pyritous earths, with an acid reaction, have been sold under the name of *animal charcoal*, and have produced, on soils containing very little calcareous matter, effects contrary to those expected from the powerful manure whose composition and effects it now remains for us to describe.

DISINFECTED MANURES.

Animal Charcoal of the Refineries.—As a general rule, plants profit so much the more from the emanations of manures, as the latter follow nearer, in their decomposition, the progress of the development of vegetables. This principle laid down, we have seen how very hard organic remains may be usefully modified by thoroughly dividing them, and too alterable soft substances by increasing, on the contrary, their resistance by a more powerful cohesion. It is understood that different means of retarding putrefaction may lead to the same end; no example is more remarkable in this respect, than the influence of bone-charcoal, which moderates the decomposition of the blood in the animal black arising from the operations of refining. This residue was thrown away until one of us, in 1824, made known its properties as a manure; since then, more than ten millions of kilogrammes have every year enriched our agriculture, especially in the western departments; and the importations of animal black from foreign refineries will concur to this new opening, which now extends to the cultures of Orne of Calvados, and several other departments.

The manure in question is composed of bone-charcoal in fine powder, agglomerated by the blood employed for the clarification of syrups, and which is coagulated in the boilers; this mixture retains interposed the small proportion of saccharine solution which the washings and pressure have not been able to extract. It contains, in the dry state, from 20 to 22 hundredths of blood, to which it owes its principal action, but whose decomposition in the ground it moderates so suitably, that this quantity of organic matter acts from 5 to 6 times more than blood employed alone. It is now a fact so well recognised in practice, that all the residuary black of the refineries realises as manure, a value proportionate to its reaction; that is to say, equal to that of six times the quantity of blood, or an equivalent quantity of the different manures.*

The fertilising properties of animal black have allowed of the residue of bone-glue, which was for a long time unused, being turned doubly to account; for the latter, converted into decoloring, granular, and pulverulent black, serves for the clarification in the boilers, and leaves the residuary black applicable, as we have just said, to agriculture.

It was thought that the surprising effects of the black of refineries might be attributed either to the carbon, or to the phosphate of lime which it contained; but, in the first place, unmixed bone-charcoal, tried in the same condition, produced only very little

The following is another remarkable consequence of these facts:—The sugar refiners, who charge from 7 fr. to 7 fr. 50 cents. for one hectol. of manure containing at the most 50 kilog. of bone black, now obtain for this residue a higher price than the total value of the fine black and blood employed in their clarifications.

The commercial importance of the residues of refineries, and some complaints concerning their quality, attracted the attention of the General Council of the Lower Loire, in 1838; and, consequently, the Prefect appointed an inspector charged with the examination of these manures, sold at Nantes to the agriculturists of the departments of the Lower Loire, Vendée, Ille-et-Vilaine, Maine-et-Loire, and Morbiham.

It should here be observed, that the determination of the organic matter in analysing the residues of refineries, is not sufficient, on account of the liability to confound with the useful principle (blood) several vegetable substances (turfs, wood shavings, &c.), calculated to impoverish rather than to enrich the manure. It is, therefore, necessary to determine the proportion of nitrogen.

The quantities of manure black entering in the Loire, annually amounted, taking the average of 1837-8-9, to 10,872,000 kilog.; it is brought from Marseilles, Paris, Orleans, Nantes, Bordeaux, Dunkirk, and Honfleur, and is imported from Hamburgh, Amsterdam, London, Cologne, Genoa, Trieste, Russia, and Bavaria.

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* Indeed, one hectol. of moist residuary black weighs 100 kilog., and costs agriculturists from 12f. to 14f. 50c., in Brittany and Normandy; the 38 to 40 kilog. of coagulated blood which it contains, represent from 11 to 12 kilog. of dried blood, the commercial value of which, in Paris, is from 2f. to 2f. 10c.

effect; and, in the second place, the phosphate and carbonate of lime, arising from burnt bones, or from the residue of bone-glue, had no perceptible action on vegetation; doubtless the absorbent properties of a porous charcoal, like that of the bone, are of real utility in lands in cultivation; but this is evinced only after a long time.

An anomaly worthy of notice presents itself relative to the residues of refineries; when spread shortly after their arrival from the manufactories, they have produced variable effects, and sometimes have appeared injurious to vegetation, whilst, when heaped up for a month or two before being employed, their more constant effect was always favorable; this was because their residues were then less completely exhausted of sugar than they now are. The former reaction produced alcohol, and carbonic, lactic and acetic acids, until the time when the animal matter, taking a great part in the decomposition, could give nitrogenous products, in which, in its turn, the favorable alkaline reaction predominated.

Animalized Black.—When the value of the residues of the refinery was well proved, the production became insufficient, and a special manufacture, to supply it, confirmed the preceding data by new and not less remarkable facts: in fact, a kind of fictitious black was prepared, by first manufacturing a carbonaceous substance with vegetable calcareous earth, calcined at a dull red heat in close vessels: the earthy charcoals, mixed two or three times with the fæcal matter, to the saturation of the disinfectant property, afterwards received from 4 to 5 hundredths of coagulated and pressed blood.

The manure thus obtained, combined the same qualities as the black of the refineries; its strength is, in general, rather higher, as our analyses show.

This new manufacture presents another kind of interest: it allows of disinfection at the time of emptying ditches, and stercoraceous matters, whose unwholesome exhalations instantly cease. By the more extended application of this means, it would be possible to avoid compromising the health and life of the men occupied in emptying ditches; to put an end to the disagreeable emanations of ditches near large towns;* to abundantly manure the most absorbent edible plants, in their green parts, without their contracting the slighest foreign odor; to fertilise meadows intended for feeding milch cows, without fear of communicating to their most delicate products any bad quality.

In many localities, in France and abroad, these processes of economical disinfection, recommended by the approbation of the Academy of Sciences, have realised the advantages expected from them.

These important operations, as well as the preparation of several kinds of rich manure, will be free from the errors and frauds which threaten to compromise them in future, when the manufacturers, consumers, and intermediate venders agree to base all their transactions on the strength of the products established by determining the nitrogen.*

The results of our agricultural observations, and of our comparative analyses, concur in explaining the effects of an important operation in rural economy, but whose utility in certain cases it would be difficult to comprehend, without holding to the theory which attributes to vegetable humus and ulmic acid, a marked preponderance among manures.

The favorable influence of cutting the turf, applied to compact lands abounding in vegetable remains, appears to us to consist: 1st, in the destruction of the excess of organic residue, too poor in nitrogenous substances; 2nd, in the transformation of the superficial layer of the soil into a carbonaceous absorbent earth, capable of retaining a portion of the ammoniacal vapors disengaged during the calcination, of facilitating the infiltration of the waters, of moderating the decomposition of the organic matter of the manures, and of condensing the nitrogenous gases produced by their fermentation; 3rd, in the decomposition of the vegetable salts into carbonates, which exert an alkaline action, useful to vegetation.

In an early work, we will continue the chemical examination of the manures which we have not hitherto been able to procure, and, in particular, leaves of trees, which it is most correct in this respect to analyse at the period of their autumnal fall.

(*The table of the analyses and comparative values of manures, completing this important Memoir, will be given in our next Number.*)

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* This healthy method of emptying has recently been adopted in the camps formed under Paris. The disinfectant property resides at once in the porosity of the carbonaceous matter which absorbs the gases, and in the presence of a small quantity of lime which, decomposing the hydrosulphate of ammonia, substitutes for the disagreeable odor of that compound, a slight and fugitive odor of scarcely altered ammonia.

* It is evident how easy it would be thus to detect mixtures containing from 0·50 to 0·90 of coal-dust, wood-charcoal, or black ashes of Picardy, and sold as animalised black, or as the residuary black of the refineries.

COMPOSITION OF THE POUDRETTE MANUFACTURED AT MONTFAUCON.*

BY M. JACQUEMART.

THIS sample was taken in March, 1833, from the middle of a heap prepared for sale.

1. The poudrette was a brown substance, in which some white points, which appeared to be efflorescences, were distinguished. It had an empyreumatic but not very powerful odor; it was moist and greasy to the touch; it was also presented under the form of small agglomerations of the size of a nut (*noisette*), and it was susceptible of becoming compact by pressure, like an argillaceous mass.

2. Poudrette, weighed several times, gave, for the weight of 1 litre, 650 to 670 grammes.

DETERMINATION OF THE QUANTITIES OF DRY MATTER AND ALKALINE WATER.

3. 335 grammes or $\frac{1}{2}$ litre of poudrette, were put into a glass retort, communicating with a phial immersed in cold water: to the phial was adapted a tube dipping in water; the retort was placed in a sand-bath; the temperature was sustained for fifteen hours at from 250° to 300° C.; during the distillation not a bubble of gas was disengaged, which shows that there was no decomposition. A few drops of empyreumatic oil, with the odor of poudrette, were distilled.

(A) The distilled liquid weighed	176 grammes, or	52·5 per cent.
The dried matter ,,	157 ,,	47·2 per cent.
	333	99·7

OF THE ALKALI CONTAINED IN THE DISTILLED LIQUORS.

4. The collected liquid (A) had a very powerful ammoniacal odor; saturated by very weak sulphuric acid, it gives rise to a very brisk effervescence at the commencement of the saturation, which would lead one to suppose that it contained carbonate, and not free alkali; this liquid contains the equivalent of 10 grammes, 7 of crystallised sulphate of ammonia, or 3·2 per cent. of the weight of the poudrette, and about 6 per cent. of the weight of the distilled liquor.

AMMONIACAL SALTS QUITE FORMED IN POUDRETTE.

5. This *assay* did not give the quantity of ammonia corresponding to the ammoniacal salts, such as the sulphates, phosphates, muriates, &c. &c., contained in poudrette. In order to determine it, 40 grammes of the dried poudrette were taken, and put, with 20 grammes of carbonate of soda, and a certain quantity of water, into a glass retort, of which these substances occupied only a small portion; it was slowly distilled; the collected liquid, saturated with sulphuric acid of known strength, contained in ammonia the equivalent of $0^{\text{gr}}\cdot42$ of crystallised sulphate of ammonia; or $0^{\text{gr}}\cdot49$ per 100 gram. of fresh poudrette.

Whence, in *all*, the quite formed ammoniacal salts which are found in poudrette, and of which $\frac{7}{8}$ are in the state of carbonate, represent 3·9 per cent. of the weight of poudrette, supposing that all the salts are converted into crystallised sulphate.

This experiment has been repeated by directly treating 200 gram. of poudrette with a solution of carbonate of soda, distilling and evaporating to dryness. The distilled liquid, saturated by sulphuric acid of known strength, gave 6·7 of crystallised sulphate of ammonia, or 3·4 per cent. of the weight of poudrette: mean, 3·6 per cent.

CALCINATION OF POUDRETTE.

6. In order to determine the ammonia contained in the animal matters of poudrette, this substance was calcined at a red heat, and the operation was continued until no more gas was disengaged, even with an increase of temperature. It was ascertained, at each trial, that the retort was not cracked, the stone retort communicated by means of an adapter, with a phial immersed in water; a safety tube, adapted to the phial, dipping in a vessel containing an acid solution, corresponding to $3^{\text{gr}}\cdot4$ of crystallised sulphate of ammonia.

After each operation, the apparatus was taken to pieces only after it was completely cold, in order that the charcoal might undergo no alteration. 100 gram. were operated on.

The products of the distillation were:—

1. A carbonaceous residue:
2. An alkaline liquid, on which floats a small quantity of brown oil which has the odor of poudrette:
3. Gas.

The carbonaceous residue was weighed, then roasted and weighed *de novo*. The alkaline liquid was saturated by sulphuric acid of known strength, then converted into alum, in order better to appreciate the ammonia; for during the distillation, it might have produced other salts than the carbonate.

Carbonaceous residue .	29·5 or	29·5
Alkaline liquid . . .	58·0 ,,	59·8
Volatile portion . . .	12·5 ,,	10·7
	100·0	100·0

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* *Annales de Chimie et de Physique*, March, 1843.

or else

Charcoal	4·0 or	4·0
Ashes	25·5 ,,	25·5
Alkaline liquid . . .	58·0 ,,	59·8
Volatile portion . . .	12·5 ,,	10·7
	100·0	100·0

Poudrette containing 52·5 per cent. of alkaline liquid, it is evident that the animalised matters produced only 5^{gr}·5 and 7·3 of liquid, which carries the weight of the animal matter to 22 per cent. in the ashes.

AMMONIACAL RICHNESS OF POUDRETTE.

7. The 58 grammes of alkaline liquor were saturated by a quantity of acid representing 6^{gr}·4 of crystallised sulphate of ammonia, and producing 48 grains of alum. (The acid employed corresponded only to 43^{gr}·6 of alum.)

The 59^{gr}·48 of alkaline liquor were saturated with a quantity of acid representing 5^{gr}·75 of crystallised sulphate of ammonia, and producing 44 gram. of alum. (The acid employed corresponded to only 39 gram. of alum.).

Whence it follows that the $\frac{11}{12}$ or $\frac{10}{11}$ of ammonia obtained, are in the state of carbonate of alkali.

It is evident, therefore, that poudrette, decomposed by red heat, gives the ammonia corresponding to 46 gram. of alum. Or 6^{gr}·86 of crystallised sulphate of ammonia, that is to say that, of the whole of the ammoniacal products produced by poudrette, 53 per cent. are in the state of ready formed carbonate and 47 in the state of organised matter.

8. The carbonaceous residue is composed of 13^{gr}·5 of charcoal (except the oxidation of the ashes) and of 86^{gr}·5 of ashes.

9. The organised matters of poudrette give ammonia corresponding to 3^{gr}·26 of crystallised sulphate of ammonia per 22 grammes of these matters; that is to say, 15 per cent. of their weight of crystallised sulphate of ammonia.

EMPLOYMENT OF POUDRETTE.

10. From 18 to 25 hectolitres of poudrette are spread on 1 hectare of land, or about 78 kilog. of poudrette per hectare. Amounting, then, in total, to from 1,400 to 2,000 kilog. per hectare, and containing:—

	Kilog.	
1 Carbonate of ammonia formed, equivalent to . .	50·4 to 72	In crystallised sulphate.
2 Organised matter, equivalent to . . .	45·6 to 65	
Per hectare in total, the equivalent of . .	96·0 to 137	

1 hectol. of poudrette, 67 kilog. contains the equivalent of 4^{kil}·59 of crystallised sulphate of ammonia, of which 2·43 were in the state of carbonate.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

THE PHARMACEUTICAL SOCIETY INDEFENSIBLE EVEN BY MR. JACOB BELL.

When, on behalf of those whose interests we are pledged to protect, we demanded of the Pharmaceutical Society, or the Editor of its Transactions, answers to certain questions of the most vital importance to the members of that Society in particular, and to Chemists generally, we defied them to answer them otherwise than to the utter annihilation of the Society; and we expressed a hope that no man would afford them further support until they had been satisfactorily replied to.

It appears that Mr. Jacob Bell was of our opinion; for he has evidently regarded our questions as so unanswerable, that he has not endeavored in the slightest degree to defend those by whom he is employed. It was impossible to give true replies to our interrogatories, without compromising himself and his Society.

Mr. Bell dares not enter the lists with us: he knows too well that we are in the right: had he replied to us with truth, he was well aware that the Society must have sunk under his confessions, and falsehood would have availed him nothing, for there was every certainty of our exposing the true state of the case. Not that he would be too nicely scrupulous about the truth; for he has answered the question of a correspondent with as bold and barefaced an untruth as ever sullied the pages of a corrupt and reckless periodical. The correspondent alluded to asks ;—"Is it true, as reported in The Chemist, that our numbers are daily falling off?"—"No!" is the scandalously false reply of the *veracious* Druggist of Oxford Street. In the face of this disgraceful falsehood, we assure our readers that our statement is true, and that it is confirmed by the really astonishing number of letters which we have received from members of the Pharmaceutical Society, stating that they are so convinced by our "plain, straightforward, common-sense arguments," that they will never pay another subscription to that worse than mockery of a Scientific body.*

Mr. Bell has dared to assail our veracity, but he shall not do so with impunity. He has not the courage to attack us openly, for he well knows his own incapability of coping with us.

It is tolerably clear that *we* have no interest to serve in defending Chemists from the encroachments of their enemies. *We* are *unconnected* with the trade, and, consequently, cannot share in the benefits to be derived from the maintenance of its rights. We stand forward as the advocates of the Chemists, and have done so from the commencement, without fear of censure, without hope of reward.

We repeat, we have no interest to serve; our sole object is the advancement, political and scientific, of those for whom we labor; and though we may have met with some ingratitude, we have the satisfaction of feeling that Chemists now know their real and tried friends, and that we have the thanks, expressed or concealed, of many an honest heart. The Chemist owes its extensive and monthly increasing circulation to the valuable nature of its contents, and to our upright, uncompromising advocacy of the rights of those for whose benefit it was established. The Journal of the Pharmaceutical Society is thrust on those who would not buy it, in order that one man may make a profit of it; it dares not stand on its own merits; its Editor knows that he has not sufficient ability to conduct a journal in such a way as to command a sale for it.

It is now certain that the Pharmaceutical Society must lose its members; for it is impossible that any man possessed of the average amount of common sense can remain a member now that that Society is so utterly void of good objects, that even the Editor of its own Transactions will not come forward in its defence.

The questions which we asked were such as every man ought to put to them before paying his subscription; and if they had been satisfactorily answered, we hesitate not to say, that we would have admitted its title to the general support of the trade; and we submit that no Chemist ought, in that case, to have omitted to enrol himself a member. We brought forward a plain, straightforward statement against the Society, and challenged Mr. Bell, as the Editor of its Transactions, to come forward in its defence; but he, feeling the hopelessness of the case, has declined the task, and is entitled to praise for not attempting to uphold that which is irrevocably bad, because such upright conduct is a deviation from his general course, which consists in defending, with the most unblushing effrontery, all that the Society does, with the more earnestness as its conduct is more censurable.

If Mr. Bell is unable to find satisfactory replies to our questions, we can supply them, and we will therefore put them into his mouth, and will suppose him to answer them in the order in which we put them. If the reader will refer to the sixteen questions asked in our April Number, the following answers, *supposed* to be given by Mr. Bell, may be readily comprehended:—

1. To obtain two guineas per annum from

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* We request, as a particular favor, those whom our remarks have induced to secede from the Pharmaceutical Society, will write and tell us so, in confidence, in order that we may hold in our own hands the proof of the good we have done: those who do so, may accept our assurance that their communications shall be kept in the most honorable secrecy.

as many as we can, and to do as little as possible for the money.

2. A diploma, and the Pharmaceutical Journal. We do this to save appearances, not because they are of any use; for the fact is, we want to make the Society comfortable for those who alone can benefit by it, namely, the druggists of the metropolis; but we do not intend that even they should profit much, as the Officers must be taken care of.

3. We fix our subscription so high for our own advantage. But really your questions are getting very impertinent. What right have YOU to interfere? You are not in the trade. Let the Chemists be gulled if they like, it is no business of yours.

4. We hope that no Chemists will ever ask us such a question, as that you put into their heads. If ever any one asks it of us, we shall call him impertinent, and tell him as we told Mr. Hildreth Kay, that we shall be better without than with them.

5. If we were to do as you say, it would ruin the thing altogether: we should make nothing by such an arrangement.

6. To use your own words—"In this case, we apprehend, nothing can be done." We are very much afraid that the Government will ruin our plans. Really your questions are very unpleasant.

7. This seventh question of yours is very silly; any body might see that the reason of our taking both the teaching and examination into our own hands, is because we think that most is to be made this way. But we are not going to tell you all about it; we have several little plans in view, of which we shall not tell you or anybody else.

8. How suspicious you are! Of course, but mind this is *entre nous*, we must not forget our own interest: that would be too much to expect.

9. Certainly.

10. We fear that you are right. We do not so much mind the injury that will thus be done to the trade generally, but it will be very hard upon us.

11. No, it does not: but why did you say anything about it? really it is very unhandsome of you; nothing will satisfy you but our ruin. Oh! you are very hard-hearted.

12. The less said about that, the better for us. The fact is, that the Pharmaceutical Society does represent *very nearly* one-eighth of the Chemists of Great Britain. What a pity it is that you will interfere in our concerns! YOU have *no* shop; alas! you have no feeling for those who have. This article of yours is enough to ruin every shop in the Society.

13. To tell the truth, it does not, and nobody knows it better than you.

14. Oh! that this cruel question had been spared us: but why should we refuse to answer it, since you evidently know the truth already? Yes, heartless, shopless brutes, we own it; the illustrious Payne, the great vice-president and bright luminary of our Society *is* an apothecary, &c. &c. &c. Would it were not so! But what of that? he is exceedingly particular about the admission of *others*.

15. Why rip open an old sore? The truth is that he gave good promise of being a very troublesome customer; so, we thought, and, indeed, we said, that "we should be better without than with him."

16. Certainly our Journal is a little puerile, but that you would not be surprised at if you knew all. Some of our contributors are very youthful; but what does that matter? nobody knows it, except you and ourselves. As regards our Editor, he thrust himself into the post, and we did not like to offend him, because now and then, he gives us such a "jolly blow out." You are quite right about his giving us something stronger than tea. In fact, next morning, we never could tell how we got home. You are quite right; we could not drink a man's champagne and refuse to support him; that would have been ungrateful. We know he is very incompetent, and that the Journal is far inferior to yours and the Continental ones, but we never read it ourselves; we only have it as a sort of something tangible to give for the two guineas per annum. Most likely nobody ever reads it; so what does it signify about its goodness? *Entre nous*, it is a *job*, and rather a bad one.

These, we may suppose to be the replies returned to our questions, and we hope that the trade will regard them as if they had proceeded from Mr. Bell himself.

We cannot conclude without again admonishing the Society to take into careful and unbiassed consideration the suggestions which we made in our last No. relative to the reduction of the amount of subscription. It would be well if some public-spirited member would put them in the form of a motion, and in that way bring them under the Society's notice: he would meet with opposition, but not to such an extent as might be imagined. We feel convinced that, under the arrangement we have proposed, the Society would prosper: our support, which, in fact, raised it to what it is, would then be more within their reach.

We call upon the members of the Society to withdraw their support, until it is differently constituted, and we shall regard every seceder as a patriot, and as a sincere friend to the prosperity of the Trade.

HER MAJESTY'S COMMISSIONERS FOR INQUIRING INTO THE PRESENT STATE OF LARGE TOWNS IN ENGLAND AND WALES, WITH REFERENCE TO THE CAUSES OF DISEASE AMONG THE INHABITANTS.

The *London Gazette* of Tuesday, May 9, contains the following announcement:—

"The Queen has been pleased to direct letters patent to be passed under the Great Seal of the United Kingdom of Great Britain and Ireland, appointing Walter Francis Duke of Buccleuch and Queensberry, K.G., the Right Honourable Henry Pelham Pelham Clinton (commonly called Earl of Lincoln), Robert Aglionby Slaney, Esq., George Graham, Esq., Sir Henry Thomas de la Beche, Knt., Dr. Lyon Playfair, Dr. David Boswell Reid, Professor Richard Owen, Captain William Thomas Danson, Jacob Ranald Martin, Esq., James Smith, Esq., of Deanston, Robert Stephenson, Junior, Esq., and William Cubitt, Esq., to be her Majesty's Commissioners for inquiring into the present state of large towns and populous districts in England and Wales, with reference to the causes of disease among the inhabitants."

The appointment of such commissioners as the above will be regarded as a sufficient guarantee for the utter worthlessness of their report. What can the noblemen and non-professional gentlemen know about disease or its causes? To appoint them to such a duty as the investigation of the causes of disease, is so ludicrously absurd, that we should be disposed to regard the whole affair as a joke, did it not so strongly bear the semblance of a Job. Why did not her Majesty add to the commission a few Bishops and Judges? But it is not too late to rectify the omission.

This commission should have been composed entirely of eminent scientific and medical men: they, and they alone, are qualified for the task; and we regard this appointment as a gross insult to those who ought to have been appointed.

But it will be replied to us, there are some medical men in the commission: yes, Professor Richard Owen, Dr. Lyon Playfair, and Dr. David Boswell Reid: the first an eminent comparative anatomist, and certainly a man of very considerable talent; the second is known as the translator of Liebig's Agricultural Chemistry; the third and last, is a lecturer on Chemistry, and inventor of a stupendous system of ventilation! So much for the medical portion of a commission, which should have included some of the greatest physiologists of the day. There are many highly talented individuals in the profession who would have reflected credit on her Majesty's choice, and who would have had the confidence of the country; but, we suppose, they had not sufficient court influence to obtain that which should have been offered to them and given to no others. Now, indeed, will our Continental neighbours have pretext for saying that the Government of Great Britain cannot find throughout the whole medical profession of the country, men capable of investigating the causes of disease in populous districts.

The commission, albeit composed of men some of whom are extremely useful in their legitimate sphere of action, is a libel on the understanding of the country; it looks like an attempt to ascertain how much humbug can be pushed down the throat of that good-natured, easy, forbearing old fellow, plain, honest John Bull.

INDIAN HEMP.*

BY T. J. FARRE, M.D.

As the observations of Dr. O'Shaughnessy on the remarkable effects produced in India by the extract of *cannabis*, or common hemp, have disposed many gentlemen to make trial of its powers in this country, may I request you to give your readers the following caution.

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* From *The Medical Gazette.*

The *apocynum cannibinum* is sold in London under the name of "Indian hemp." It is a native of Canada and Virginia, and has no resemblance to the true hemp, except in possessing a tough fibrous bark, which is applicable to the same purposes in the arts. In the *U. S. Pharmacopœia* it is termed "Indian hemp." The officinal part is the root, which is powerfully emetic and cathartic. But the part which I have seen supplied as Indian hemp consists of the leaves and the follicles filled with numerous silky seeds. As the follicles are two to three inches long, and the silky seeds are abundant, they can hardly have escaped the notice of those who may have inadvertently used this article under the idea that it was the hemp from India. The true Indian hemp, or "gunjah," is our common hemp; and consists of the flowering branches, two or three feet long, nearly destitute of leaves, and having the flowers and fruit (hempseed) agglutinated together by the resinous secretion. As the most powerful antispasmodic properties have been attributed to this plant, it is important that no false conclusions should be drawn in consequence of the employment of a wrong article. I am not aware that any real Indian hemp is at present in this country except the supply recently brought by Dr. O'Shaughnessy, and left with Mr. Squire, of Oxford Street. We have at present little experience of the medicinal properties of English hemp. A hotter climate, a more intense light, and different soil, may give to it properties which are scarcely developed in this country, but as the resinous secretion is not wanting here, it appears deserving of a careful trial.

[We received a quantity of the Indian hemp from Messrs. Davy, Macmurdo and Co., about two years ago, and we then understood from them that they had a large supply.—Eds. Chemist.]

PREPARATION OF EMETIC.[*]

BY E. SOUBEIRAN.

℞ Pulverised sulphuret of antimony sifted through a fine sieve	12 parts
Pulverised nitrate of soda	10 ,,
or	
Nitrate of potassa	12 ,,

Mix intimately in a mortar.

On the other hand, put into a porcelain capsule, or if operating on a large scale, into a leaden boiler:—

Water	24 parts.
Concentrated sulphuric acid	12 ,,

Carry to ebullition and then add by small portions, the mixture of sulphuret of antimony and nitre, making a fresh addition only when the matter already added has taken a grey color. When all the mixture has been introduced, evaporate, by boiling, almost to dryness, remove the vessel from the fire, and leave the matter to cool.

Reduce the grey white mass thus formed to the state of paste, by means of a little water, add a greater quantity of water and decant, and repeat this several times, until there remain only a few heavy particles of sulphuret of antimony, which have not been attacked.

Wash the fine deposit by decantation, until the washing waters have lost all acidity, and drain them with care; then

℞ Of this humid sulphate of antimony	the whole.
Powdered cream of tartar	11 parts.

Make, with a sufficient quantity of water, a paste, which is to be exposed to a gentle heat for some hours; afterwards add 96 parts of distilled water, boil for some time, and filter the boiling liquor in order to obtain crystals; the supernatant liquors will furnish a new quantity of them. Finally, the last supernatant liquors, saturated by a little potassa, will still yield more.

Dr. Mohr prefers this process to all others on account of the facility of its preparation and the goodness of the product. Success in the preparation of emetic greatly depends on the first preparation of the oxide of antimony; if the latter has been made in the humid way, it dissolves in cream of tartar more easily than if it has undergone deflagration, calcination or fusion.

Care must be taken that the oxide of antimony be as free as possible from iron, for it is very long and difficult to free it from it by crystallisations; much of the beauty of the product, time and fuel are lost. Although the powder of Algaroth easily dissolves in cream of tartar, we hesitate to recommend it, because its preparation, operated on large masses is not without difficulties in the process just described, which does not differ from that given in the *London Pharmacopœia*, in 1809; iron, arsenic, and the acids of antimony are got rid of. We operate with common matters which are found in sufficient quantity, because the sulphuret which remains mixed with the oxide is not useless; by its presence it prevents the formation of the acids of antimony.

I report this process, because my own experience proves that it is, as Mohr says, of easy execution, and that it gives an advantageous product. It is, properly speaking, the process of Mr. Philips, in which a convenient means of preparing the sulphate of antimony has taken the place of an almost impracticable process.

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[*] From *Geiger's Universal Pharmacopœia*, continued by Mohr.

ASSAFŒTIDA, A CURE FOR HOOPING-COUGH.*

BY M. REIKEN.

M. Reiken has found assafœtida more useful in removing hooping-cough than any other remedy he employed. In order to insure success, it was found necessary to delay its administration till the feverish stage had passed. He chiefly administered it in clysters, as children object to taking it by the mouth. One half-grain of assafœtida with the yolk of an egg were dissolved in six or eight ounces of water, which quantity formed ten or twelve clysters for children under one year; five or six for those under three years, and two or three for those older than that. Two clysters were administered daily. If the remedy excited diarrhœa, the quantity of the yolk of an egg was increased, and tenesmus was allayed by adding olive-oil. He sometimes employed the remedy externally by mixing it with lard.

ON THE USE OF MALT LIQUORS.

To the Editors of The Chemist.

Gentlemen,—

When I wrote to you respecting the use of malt liquors as drinks, it was not my object to enter on that almost threadbare subject—their effects on the morals of society at large; but rather to consider their effects on the system generally, and in doing so I have drawn down upon myself some remarks from a correspondent of yours, signing himself "Virtutas," in whose letter there are one or two points which, with your permission, I will consider.

Passing over all your correspondent's attempts at the sentimental, such as "the native brilliancy of truth," and its "scintillation," we arrive at the following in his second paragraph:—"The application of these stimulants tends to his (man's) injury, because nature has provided him with no organ for their assimilation." This is absolute nonsense, and evidently shows that "Virtutas" is writing on a subject about which he knows nothing; he should learn that man is not furnished with a different set of organs for the digestion and assimilation of every particular kind of food, but that he has only one receptacle for such aliment: and that the injury which is frequently effected by some kinds of food, is not merely owing to the inability of the organs to assimilate them, but to their direct chemical action upon those organs.

Your correspondent further says, that "Nature has set her voice" against these drinks; but, may I ask what proof he has of this? It is really amusing to behold the effrontery with which men will declare a thing to be as they desire. As for forbidding the use of malt liquors, because some people make fools and beasts of themselves by taking "a drop too much," this is absurd in the extreme, and is a principle which, if carried out, would lead us to decry the use of everything both eatable and drinkable, because some are gluttons. This may be all very well, yea, even virtuous, in theory; but the practice, how difficult would that be!

Now, as regards the principles of the "Irish patriot," which your correspondent supports, I hold with them to a certain extent, and which is this,—that if a man has not the sense to know when he has taken that quantity which will "revive drooping nature" after exhaustion; and that if he cannot satisfy the demands of nature without overloading his system, and thus deranging it, he will act wisely to abstain from anything, ay, even though it be "praties," which should be possessed of such charms for him as to induce him to indulge to excess; but, on the other hand, any man who can be satisfied with the *quantum sufficit* in its proper sense, would almost be as unwise as the former one, were he to pledge himself not to partake of any drink which had undergone the vinous fermentation. I am willing to confess myself no advocate of excess in drinking, even though it be water; and I feel confident that were your correspondent to consider the effects of this liquid when taken in excess, he would come to the conclusion which I have long since arrived at, namely, that, however harmless any thing may be in small quantities, when taken in large doses it may be productive of mischief.

Dr. Johnson has said, that total abstinence is easier than temperance, and therefore I admit that Temperance Societies (Total Abstinence Societies they should be termed), are very good institutions for those animals (they can be called no better) who are not satisfied with moderate quantities, but must either, on the one hand, totally abstain, or indulge to a vicious extent.

I may conclude by remarking, that alcohol contains no principle which would at once stamp it as an injurious article; it is a compound of carbon, oxygen, and hydrogen, and is as capable of undergoing that combustion in the system necessary for the production of animal heat, as any other substance containing those elements; and, therefore, the only thing to be said against it is, that from its exhilarating effects upon the system, people are apt to take more of it, especially in society and after the toils of the day, than prudence would dictate; but of this I am satisfied, that moderate quantities are not only harmless, but frequently beneficial.

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* *Edin. Med. and Surg. Journal*, April, 1843.

My chief object when I first wrote to you was to call the attention of your medical readers to a particular beverage which I have frequently used with advantage, as, I doubt not, have many others.

Suggesting the propriety of your correspondent re-considering his communication to you, and feeling confident that he will come to the conclusion that it is of a piece with all that has been previously said against fermented liquors by moralists, a *mere* collection of *assertions*, and leaving the discussion of the morality of the subject to more able hands, and which portion I beg leave to suggest would be more appropriately treated of in *The Evangelical Magazine*, or some other equally excellent religious periodical, than in The Chemist.

I remain, Gentlemen, respectfully yours,
Medicus.

QUININE IN ASTHMA.[*]

BY B. R. HOGAN, ESQ.

Mr. Hogan was induced to try the effect of doses of quinine in asthma, from its known efficacy in all paroxysmal and congestive diseases. It surpassed his most sanguine expectations, curing every case in which he had an opportunity of administering it. He gave from two to eight grains in one dose, and repeated it in an hour if relief did not follow.

MERCURIAL CIGARS.[†]

M. Paul Bernard lately proposed to the *Académie de la Médecine*, the use of cigars impregnated with a weak solution of bichloride of mercury, for persons afflicted with syphilitic affections of the throat and palate, as a mode of conveying mercurial fumigation. It has been proposed first to deprive the tobacco of its narcotin by frequent washings.

LAXATIVE EFFERVESCING MINERAL WATER.[‡]

Put into a quart bottle of spring water eight *grammes* of carbonate of magnesia; add at intervals a sufficient quantity of sulphuric acid of commerce to saturate the magnesia, leaving, however, a slight excess of the carbonate, after each addition of sulphuric acid. Cork the bottle, shake it, and then place it for some minutes in cold water. The effervescing water thus obtained is cheap, sparkling, and of a fresh and agreeable taste.

ACONITE IN RHEUMATISM.[*]

BY DR. BUSSE.

Dr. Busse, of Berlin, has published a monograph on the use of aconite, in which he recommends it in acute as well as chronic rheumatism. If there be a foul condition or inflammation of the primæ viæ, that must be removed by appropriate treatment previous to its administration. He has never seen it cause any excitement of the vascular system, as camphor does. The diaphoresis which it induces is neither preceded nor accompanied by any disorder of the system, and the removal of the rheumatismal pains is obtained, sometimes without any increase in the renal or cutaneous secretion. The formula employed by Dr. Busse, for the last twenty-five years, is a prescription of Richter, and is as follows:—4 scruples of extract of aconite, dissolved in 30 of tartar emetic wine. Of this, at first he gave only small doses, in accordance with Richter's advice, from 15 to 25 drops every two hours, but he soon found he could give double the quantity, not only without danger, but with greater prospect of success. In order to prove the harmlessness of very large doses of aconite, he mentions that a patient took, in the course of ten hours, 2 scruples and 5 grains of the extract, dissolved according to the preceding formula, without the supervention of any symptom of narcotism or other serious disorder, the only evidence of its action on the system being a great increase of the perspiration, and, at the same time, a notable diminution of the pain, which had been experienced with exceeding severity in the morning.

Dr. Busse now begins with from 30 to 40 drops at a dose, and rapidly raises it to 60. He has found it of equal service in all cases of pain arising from a rheumatic origin, in tooth-ache, cramps of the stomach, &c.

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[*] *American Medical Intelligencer*, Feb. 1842.

[†] From *The Lancet*, May 13, 1843.

[‡] *Medical Times*.

[*] *Hufeland's Journal*, and *Lond. and Edin. Monthly Journal of Medical Science*, May, 1843.

ON THE ADULTERATION OF THE RESIN OF JALAP.*

BY M. GOBLEY.

The resin of jalap sold in commerce is rarely pure; it may even be said that it is never so. The resin of guaiacum is the substance most commonly found mixed with it.

Two means of recognising this fraud are indicated; the employment of nitrous gas, and the employment of ether.

Employment of Nitrous Gas.—This process consists in dissolving a small quantity of the suspected resin in alcohol at 88° Centigr., in imbibing with this liquor a sheet of white paper, and in exposing this paper to the action of nitrous gas. If the tincture of jalap resin contains resin of guaiacum, the paper should acquire a blue color; in the contrary case, it does not change color. But is this means capable of detecting very small quantities of guaiacum resin in jalap resin? To ascertain this, I made two solutions: the first was prepared with 10 gram. of jalap resin, obtained by Planche's process, and 40 gram. of alcohol at 88° Centigr.; the second was made with 1 gram. of resin of guaiacum, and 99 gram. of alcohol at 88° Centigr. This last solution contained then, per gramme, 1 centigramme of resin, which centigramme was the thousandth part of the jalap resin in the first solution.

When the two solutions were prepared and filtered, I added, by degrees, to the tincture of jalap resin, a gramme of the tincture of guaiacum resin. At each addition, I steeped a piece of white paper, which I afterwards exposed to the action of the nitrous vapor. It was only when it arrived at $\frac{20}{1000}$ that the paper perceptibly acquired a bluish coloration. It is important that the nitrous vapor to which the paper is exposed be weak; for without this precaution the bluish color would disappear almost as soon as it manifested itself. These $\frac{20}{1000} = \frac{1}{50}$ or 2 per cent.; it is then only when jalap resin contains at least 2 per cent. of guaiacum resin, that it can be detected by means of the nitrous vapor.

Employment of Ether.—Ether dissolves the resin of guaiacum very well, but it does not dissolve the resin of jalap, as was first observed by Planche. Indeed, by treating 1 gram. of powdered jalap resin by 15 gram. of rectified ether, and decanting after 12 hours contact, taking care to agitate frequently by means of a glass tube, I obtained by evaporation only a small quantity of fatty matter, but not the least trace of jalap resin.

It is on the solubility of the resin of guaiacum, and the insolubility of the resin of jalap in ether, that the means of detecting the presence of guaiacum resin in jalap resin is based. But can very minute quantities of guaiacum resin be thus detected? To convince myself of this, I weighed 10 gram. of jalap resin and 1 gram. of guaiacum resin: the two resins, dissolved in a sufficient quantity of alcohol, were brought, by evaporation, to the pulverulent state. The powder was introduced into a flask with rectified ether; after a contact of one hour, having taken care to occasionally agitate with a glass rod, I decanted the ethereal liquor. Evaporated, it left as a residue a little fatty matter, plus the small quantity found in the ether, which water was rendered opalescent by the presence of the resin of guaiacum. Indeed, by adding some drops of alcohol at 88°, I obtained a perfectly transparent liquor, in which the fatty matter floated. A paper imbibed with this liquor, and exposed to the action of a feeble disengagement of nitrous gas, took a bluish tint.

Ether is, therefore, the best agent for proving the purity of jalap resin, since it allows of the separation of the most minute quantities of guaiacum resin. Thus, all the jalap resin which yields to ether a portion of resinous matter should be rejected. Colophane, a resin which is sometimes mixed with the commercial resin of jalap, may be detected in the same way.

Although we are thus able to ascertain the purity of the resin of jalap, I think that this substance is one of those energetic medicines which the druggist should always prepare himself.

NEW MODE OF GALVANISING.*

Dr. Dick, in his work on the Derangement of the Digestive Organs, speaking of the purely functional nervous derangements, and their treatment by internal and external galvanic factors, says, various modes of experiment, not indicated by him, may be plausibly adopted. For example, after loading a man's system, as far as prudence warranted, with zinc, both by means of inunction and internal exhibition, he procured a copper vessel, nearly capable of containing him. In this he was placed, and water, in which as much nitric acid as sufficed to acidulate had been infused, was poured around him. Reaction very evidently ensued between the copper vessel and the zinc in the man's body, through the medium of the nitricised water. He became aware of a disagreeable, mixed *numbing* and *pulsating* sensation through the body generally, but especially about the middle parts.

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* *Journal de Chimie Médicale*, April, 1843.

* *Medical Times.*

UREA DISCOVERED IN THE BLOOD OF INDIVIDUALS LABORING UNDER INFLAMMATION OF THE LUNGS.*

BY DR. F. SIMON.

Having taken the coagula of six bleedings performed upon males and females, laboring under inflammation of the lungs, with a view of procuring a quantity of hæmato-globulin, Dr. Simon found that, by treatment with ether, alcohol, &c., and, finally, the addition of nitric acid to the syrup-alcoholic extract, and desiccation under the air-pump, he procured a crop of crystals, which, under the microscope, presented themselves as an aggregate of rhombic tables, and which he discovered to be nitrate of urea.

ON THE HYGIENIC INFLUENCE OF CLIMATE IN REFERENCE TO THE ELECTRIC FLUID.†

Cold and dry air acts as an isolating medium, damp air as a conductor, to electricity; to the first we refer the sanguineous temperament, to the second the lymphatic, while the bilious temperament is dependent on a hot and dry climate. The nervous and melancholic constitution is generally attributed to the hot and moist climate. The contact of the heterogeneous tissues, nerves and muscles, and which are all supplied by the arterial blood, serves to give rise in them to the two opposite states of electricity. The membranous system contributes to the preservation and the accumulation, as well as to the distribution of electricity. The emission of the organic electric fluid takes place, 1st, in the functions of the nervous system; 2nd, in the chemical combinations formed in the body. From the above remarks we may easily understand that the electric fluid is the probable cause of numerous diseases, attributed to the variations and vices of the atmospheric constitution. Sometimes the atmosphere, surcharged with free electricity, imparts this fluid to the organism, and causes it to suffer; at other times, a hot and an electric atmosphere, exciting the vital electricity, and rapidly absorbing this fluid, turns suddenly cold, becomes an isolating medium, and, the organism being surcharged with its own electricity, suffers in like manner; we know also the results of an electric current and of sparks upon an organism. This electric physiology is of great use in furnishing rational indications of treatment:—in respect to a preservative treatment, 1st, by the use of isolating garments, (flannel, silk); 2nd, by the change of climate: in regard to a curative treatment, 1st, by diminishing the erethism of the blood, by means of bleeding; 2nd, by withdrawing a part of the electric fluid by causing an increase in the serous secretion, as, for instance, by the application of a blister; 3rd, by *watching* the sympathetic phenomena; 4th, by favoring the febrile crises by tepid baths, diaphoretics, diuretics, emetics, drastics, quinine, electricity.

ARSENIC IN BREAD.*

Some persons at Soignies, having shown symptoms of illness which were attributed to the bad quality of the bread, a chemical analysis was made, which led to the discovery of a quantity of arsenic, sufficient to account for the phenomena observed.

EFFECT OF TARTAR EMETIC ON THE GENITAL ORGANS.†

Mr. Griffith relates the two following instances of the appearance of a copious crop of pustules all over the scrotum after the application of the unguent. antimonii potass. tart. to other parts of the body, no eruption occurring in the situation where the remedy was applied.

In May, 1838, Mr. Griffith was consulted by a young man laboring under symptoms of incipient phthisis; an ounce of tartar emetic ointment was directed to be rubbed on the chest in the usual manner. In the course of a few days the whole of the scrotum was found to be covered with a dense crop of pustules far advanced towards suppuration; the patient was charged with having applied his hands to the parts after using the ointment; this, however, he resolutely denied; the pain was soon relieved by cold saturnine lotions, anodyne fomentations and emollient poultices, &c.

Soon after the above, the following case occurred:—

Mr. J. D., aged thirty-nine, a respectable farmer, consulted Mr. Griffith for some hepatic affection; he was, in addition to other treatment, directed to rub in, every four or six hours, a tea-spoonful of an embrocation containing one drachm of tartar emetic; on the third day a dense crop of pustules was found covering his scrotum; he, also, like the other patient, protested that he had immediately washed his hands each time after using the ointment. In neither instance was there the slightest trace of any redness or irritation on the part to which the application was directed to be made. Mr. Griffith, therefore, concluded that "absorption had taken place, and some specific action exerted on or conveyed to the external covering of the scrotum, similar to what is observed in persons who have been exposed to the fumes arising from the consumption or volatilisation of arsenious acid in various trades and manufactures."

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* *Müller's Archiv.* No. 1, 1843; and *Lond. and Edin. Monthly Journ. of Med. Science*, May, 1843.

† *Annales Medico-Légales*, and *Medical Times.*

* *Medical Times.*

† *Provincial Med. Journ.* Nov. 12 and 15, 1842.

Dr. Pereira, in his work on Materia Medica, remarks:—"Occasionally adventitious eruptions have appeared in other parts of the body, which have been ascribed to absorption of antimony into the system. But I believe, with Rayer, that they arise from the inadvertent application of the ointment to these parts." In these two cases, however, such does not appear to have been the fact.

Since the publication of the above, a letter has appeared from Mr. Pitt, of Mattishall, relating the following similar case:—

J. D. was ordered to use the tartar emetic ointment for chronic swelling of the knee-joint, after rheumatism, which soon produced a crop of painful pustules on the inner side of the knee; he was then directed to continue the application on the outer side; this soon produced a severe effect upon the scrotum, the pustules here assuming quite a confluent character. He denied having touched the part either with the ointment or his unwashed hands. The patient was of spare habit, and had his scrotum much relaxed by confinement to bed, which probably rendered it more susceptible of the action of the ointment; but whether it was carried to that organ by absorption, or was brought in immediate contact with it by means of the shirt, appears doubtful. Mr. Pitt has seen a similar affection on the scrotum of a lad fifteen years of age, whose mother had been rubbing croton oil over the abdomen, and had carefully avoided all other parts.

ACETIC EXTRACTS.*

Mr. Ferrari assures us that extracts of aconite, cicuta, hyosciamus, and stramonium, prepared with distilled vinegar, are much more active than those made with water. He has obtained still more active extracts by treating the plants with alcohol at 36°, containing $\frac{1}{36}$th part of its weight of pyroligneous acid.

STATISTICS OF DISEASE.*

MEDICAL INSURANCE.

It is well known that the mortality of disease is as susceptible of calculations—as reducible to an exact proportion—as the ordinary and average mortality of the whole population. In *Chambers's Edinburgh Journal* we recollect to have read an excellent article on the certainty of common events, in which it was shown, that if we take a large number of instances, the average is a matter of perfect certainty, which may be perfectly predicted. Taking advantage of the principle, that the mortality of disease is an ascertainable proportion, an Assurance Company has been formed, which will insure any life for a proportionate advance of premium. Take, for instance, cholera: it has been ascertained, that out of every 100 persons attacked in this country, 38·5 have died; hence a company would be safe in insuring persons attacked with cholera at a premium of 45 per cent., and would reap a paying profit. This is a very extreme case; but many of the diseases which ordinary insurance companies refuse, such as consumption, asthma, disease of the heart, and other fatal but chronic maladies, may evidently be insured, with profit to the insurers and advantage to the insured. It was, therefore, with much satisfaction that we perused the prospectus of "The Medical Invalid and General Life Insurance Company," with an adequate capital, and trust-worthy directors, having for its avowed object the assurance of bad lives for adequate premiums:—it does more, it grants increased annuities on diseased lives, so as to increase the comforts of the afflicted and solitary. Considering the certainty of the mortality of diseases, it seems strange that a Sickness Assurance Company was not established a long time since; however late it be, the new Assurance Company will confer vast benefits on the community; and as it is headed by the names of Sir Henry Halford, Sir Wm. Burnell, and Sir Matthew, Tierney, we doubt not its affairs will be prudently conducted. As a recommendation to our own readers, we may mention that it insures colonial lives.

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* *Provincial Medical Journal*, May 20, 1843.

* *The Atlas*, *Feb.* 25, 1843.

UNGUENTUM CETACEI.

Mr. Embling, of Brompton, in a letter to the Editor of *The Lancet*, calls attention to the substitution of cocoa-nut oil for the olive oil prescribed by the *Pharmacopœia*, in the composition of the unguentum cetacei. He has found that it forms quite as emollient an ointment as the sweet oil, if not more so. It is cheaper, "more pleasant of smell," requiring very little, if any, cera alba, in the preparation of spermaceti ointment.

[We doubt its being "more pleasant of smell," for we regard the odor of cocoa-nut oil as peculiarly disagreeable.—Eds.]

OPIUM SMOKING AND ELECTRIC SHOCKS IN ASTHMA, &c.

In a letter to the Editor of *The Lancet*, dated Cuddalore, Mr. Preston, Depôt Surgeon, mentions the suggestion of Dr. Johnson relative to the employment of opium smoking in tetanus, hydrophobia, tic douloureux (especially of the facial nerves), violent spasms, and painful diseases that defy the power of opium taken in the common way. "Now," says Mr. P., "as it is the generally received opinion that asthma is a spasmodic affection, and as late experiments by Dr. Williams have demonstrated that the lungs and air-tubes are actually contracted to a very considerable degree, it appears highly probable that many cases of asthma would be benefitted by opium-smoking, which is much more rapid in its effects, as well as more powerful. It appears not improbable, from the nature of asthma, that a few electric shocks might put an end to a fit, and I beg that you will make both suggestions known through the medium of *The Lancet*.

TREATMENT OF SWELLED TESTICLE IN THE EARLIEST STAGE.*

BY DR. ALLE.

When, in the case of gonorrhœa, the testicle becomes painful, and begins to swell, repeated experience has satisfied Dr. Allé that there is no remedy so effectual as compression of the affected gland, by means of ell-long and finger-wide strips of adhesive plaster. The plaster is to be applied so as to keep up an equal and general pressure. The patient is, at the same time, to be strictly confined to bed, and kept on low diet. In the course of twenty-four hours the pain and swelling will have disappeared, and the first apparatus may be covered and drawn closer by means of a first application of strips of sticking plaster.

ON THE EFFECTS PRODUCED BY ARSENIOUS ACID.*

BY M. CHATIN.

From experiments recently made by M. Chatin, he draws the following conclusions:—Arsenious acid is absorbed by the respiratory as well as the digestive and cutaneous surfaces. It has very different effects on different animals: its poisonous qualities seem to develope themselves most lightly in those whose respiratory and cerebro-spinal nervous systems are most highly developed, and in whom the poison is the most rapidly eliminated in the urine. The presence of a large quantity of fluid in the pleuræ of animals killed by arsenic is a remarkable recurrence; but M. Chatin leaves to homœopathists to determine whether arsenic becomes thereby a specific for pleurisy.

POISONING BY CANTHARIDES.†

BY DR. POUMET.

The *Annales d'Hygiène Publique*, for October, 1842, contain a very lengthy and verbose communication from Dr. Ythier Poumet, of Orleans, detailing a series of medico-legal experiments, on poisoning by cantharides, carried on with the more especial object of detecting the poison by examination of the body after death, either previous to or after inhumation. He administered the fly in substance, in powder, and in the form of blistering plaster, to the animals which were the subject of his researches. The dose of the fly in substance varied from two to three scruples of the powder, from one to five scruples of the plaster; the average dose was twelve scruples, containing about two and a half of the powder. In the plaster used, the cantharides formed rather more than one fifth part of its composition. The poison was in every instance mingled with some article of food, such as lard, sausage-meat, boiled beef, pastry, &c. In several instances, the animals experimented on were kept without food for thirty, forty-eight, and fifty-two hours previously; others were fed a few hours prior to the administration of the poison. In no case was the œsophagus tied, Dr. Poumet being desirous that the cases of poisoning resulting from his experiments should resemble those where the cantharides are given with a criminal object as much as possible.

The physical characters of the cantharides have been referred to by Fodéré, as constituting the best proof of poisoning by its ingestion; but Dr. Poumet observes, that he has searched for these signs at least twenty times on the internal surface of the intestine, blown out and turned inside out, or incised and laid open, but not desiccated, and in vain. Under these circumstances, he determined to spread out in very thin layers, on plates of glass, the vomited matters, the contents of the alimentary canal, and the fæces; and to dry them without further preparation. The canal itself, having first been drawn out vertically, and stretched by a weight attached to its lower extremity, so as to efface its curves, convexities, &c., was blown out and dried, and then cut into pieces, each of about the size of a playing card. If there are any portions of the powder present, they will then be readily discovered, either with the naked eye or a magnifying glass. Unless the glasses on which the suspected matters are spread are examined by sun-light, the experimentalist will not be justified in declaring that there are not any traces of the poison to be discovered. The intestinal matters which contain the largest quantity of cantharides, are in the first place those contained in the great intestines, and the fæces passed during life; next, the mucus contained in the small intestines; and thirdly, that of the stomach. The same order obtains with respect to the different portions of the desiccated alimentary canal.

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* *Oester. Med. Wochenschrift*, No. 50, Dec. 1842.

* *Gazette des Hôpitaux*.

† *Provincial Medical Journal*.

Dr. Poumet recommends that, in addition to the research after the physical characters of the cantharides, a chemical analysis for a metallic poison should be had recourse to in every instance, as it is perfectly possible that a double case of poisoning by the fly, and either arsenic or corrosive sublimate, may have been effected, and the latter part of the crime escape notice from want of the necessary analysis. He adds as a reason, that the criminal might escape from justice in a case of poisoning from cantharides only, by the plea of love, which would not be admitted if the double crime had been perpetrated. Such an excuse would scarcely be listened to in an English court of justice. Besides, the performance of the chemical analysis recommended has this further advantage, by establishing the proof that death has not been caused by any metallic poison, of increasing the number and value of the presumptive evidence of poisoning by lyttæ.

There are certain other insects of the coleopteræ, which, taken in powder, internally, would present appearances that might be mistaken for the *pulvis cantharidis;* but they, with scarcely an exception, differ in a toxicological point of view, not being either vesicant or poisonous, besides which they are not kept by any druggist, so that, in order to their administration, they must be collected, dried and powdered by the person wishing to use them,—a degree of trouble which would scarcely be taken by any one, unless they were looked upon in the light of cantharides, in which case they would not effect the object proposed, nor would any symptoms of poisoning ensue. In order that a mistake of this kind should take place, it would require that the criminal should give an insect altogether harmless, instead of one eminently fatal, to a person laboring under a severe acute disease of the alimentary canal, suddenly occurring without any appreciable cause, and accompanied with the symptoms indicative of disorder of the urinary organs, a concatenation of circumstances very rarely, if ever, to be met with.

If the insect has been administered entire, and passes so, or is found in that condition, no doubt can then be entertained as to the nature of the cause of death, nor should any reasonable hesitation be experienced if the insect be so coarsely powdered, that an entomologist can discover and point out some of the characteristic indications proper to this insect.

Dr. Poumet did not discover any morbid alteration worthy of notice in any of the animals upon which he operated, although he carefully examined all the organs. The gangrene of the penis, so generally met with in man, did not occur in any instance.

It is difficult to decide in what dose cantharides produce death in man. Batt mentions a case in which ten grains caused most severe symptoms; and Amoreux lost a patient who took only a pinch, while Fodéré mentions the case of a consumptive patient, who, after having swallowed about a tablespoonful of the same powder (two ounces), was affected only with heat of the throat and *ardor urinæ.* A number of inevitable, unforeseen circumstances vary the degree of noxiousness, of fatality, of two equal quantities, or even of a larger dose; the cantharides in the one case may have been taken whole, in the other in powder, or the powder may have been old, and changed in its properties, or fresh and full of power; one person may have taken it fasting, another during or after a copious meal; sometimes a large quantity is vomited, more frequently the whole is retained; and, finally, the nature and quantity of the menstruum employed, the length of time which has elapsed between the swallowing of the poison and the administration of remedies, all must considerably modify, or altogether destroy, the *methodus agendi* of these coleopterous insects. These differences, which have been remarked in man, also occur in animals expressly poisoned; although with them it is almost possible to have every thing as equal and correct as it should be.

Dr. Poumet deems himself entitled to draw the following conclusions from his experiments:—

1st, The presence of cantharides internally administered, either entire, or in fine powder, may be demonstrated in the vomited matters, in the fæces passed during life, in the mucus of the œsophagus, the contents of the stomach, small and large intestines, in the matters found on the margin of the anus, and on the internal surface of the insufflated, stretched and desiccated alimentary canal.

2nd, The traces of the poison may be discovered and recognised, not only 24 or 30 hours after death, in 72, 93, or 95 hours, 8 or 26 days after it has been swallowed, but even 15, 20, 200, or 210 days after interment.

And, 3rd, The shining particles of the Spanish fly cannot be mistaken for red, or copper filings.

NITRO-HYDROCHLORIC BATHS IN CASES OF MERCURIAL SALIVATION.[*]

BY DR. BAUMGARTEN.

Nitric acid	8 parts.
Hydrochloric acid . .	8 parts.
Water	Q. S.

A wooden bath must be employed.

POWDER IN AMENORRHŒA.[†]

BY DR. TSUHIERSCHKI.

℞ Extract of yew leaves .	10 centig.
Calomel prepared by sublimation . . .	5
White sugar . . .	60
Volatile oil of sabine .	1 drop.

M. and F. S. A. a perfectly homogeneous powder.

For one dose.

The author recommends the use of this powder, especially in cases of amenorrhœa complicated with chlorosis.

One dose must be taken morning and evening, in a theiform infusion of peppermint, and properly edulcorated saffron.

SINGULAR FACT.

In a report of a *post mortem* examination made by M. Rousset, professor at the Marseilles School of Medicine, it is stated that at the time of the analysis of the matters extracted from the body of a man named Claude Barbe, who was suspected to have died through poisoning by laudanum, it was assailed by an enormous number of insects, who met their deaths by precipitating themselves into the matters extracted from the body. This circumstance caused the medical gentlemen engaged in the investigation to suspect that the body contained arsenic, which is, as is known, the base of the poison called fliesbane. Consequently, they devoted themselves to new investigations, with the view of detecting arsenic; and for this purpose, they used Marsh's apparatus, with the modifications made in it since its invention, and conforming to the prescriptions of the Institute. These investigations ended in their finding arsenic in the body of Barbe.

ON THE EMPLOYMENT OF THE MUCILAGE OF QUINCE-SEEDS IN COLLYRIA.

BY M. GAROT.

With the view of obviating the difficulty experienced in practice, in conveniently preparing, in an always identical manner, the collyria containing the mucilage of the quince, as also in order to furnish practitioners with an exact evaluation of the mucilage which they wish to introduce into these collyria, I first prepare dry mucilage, which I use as occasion requires, in the proportions given below. In the persuasion that this process is of useful application, I think it my duty to make my brethren acquainted with it.

PREPARATION.

℞ Quince seeds . . .	100 gram.
Macerate, twice, for some hours, in water at 50° or 60° C.. . . .	3 kilog.

Strain with pressure; evaporate to three quarters at a gentle heat, and finish the desiccation either on the stove or on the lid of a saucepan.

In this manner, 10 gram. of a dry product are obtained; the substance is friable, translucid, and analogous in appearance to dried white of egg. This matter absorbs and almost immediately converts into mucilage a much larger quantity of water than gum tragacanth. The difference is even remarkable, when it is considered that the 10 grammes of mucilage convert the 3 kilogrammes of water employed for their formation into a magma of much more consistence than white of egg. 1 decigr. of dry mucilage was sufficient to communicate to 100 gram. of water a semi-syrupy consistence.

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[*] *Caspar's Wochenschrift für die Gesammte Heilkunde.*

[†] *Ibid.*

[*] *Journal de Pharmacie et de Chimie*, April, 1843.

By following this process, an always identical preparation will be obtained, which may be rendered more or less thick at will, and may be prepared without inconvenience and with facility in sight of the public.

DETECTION OF LEAD IN THE MUSCLES PARALYSED BY IT.[*]

The following curious statement is taken from a paper in the *Medico-Chirurgical Transactions*, Vol. XXV., by Dr. William Budd, on the Symmetry of Disease :—

" Paralysis of the hands in house painters and white lead manufacturers, does not depend on affection of the nervous centres, but is a purely local effect of the poison. This is evident from the limitation of the paralysis.

" Lead has been detected in the palsied parts by direct experiment. This fact has been repeatedly ascertained by M. Tanquerel, and by MM. Devergie and Guibourt, and quite recently at King's College Hospital.

In a man who died there, under the care of Dr. G. Budd, of epilepsy from lead poisoning, and who also had wrist-drop, Mr. Miller detected lead in abundance in the paralysed extensors of the hand.

MUSTARD-SEED.[†]

To the Editor of The Lancet.

Sir,—Simple remedies are not always to be despised. It always gives me pleasure to peruse (though not of the medical profession myself) your talented publication, *The Lancet*, as it most liberally opens its pages to all suggestions that are likely to further the public good by attracting the notice of members of your honorable profession. I am thus induced to trouble you with the following particulars, which I shall be gratified to see inserted :—

When a youth, I was troubled with rheumatism in my head, which, at times, it was most difficult to endure, my pain and distraction being such, that I could scarcely hold my head upright. Many were the remedies employed (besides flannel night caps and brown-paper caps, which I was desired to wear at night), but all in vain. At last, about twenty years ago, I was advised to visit a certain quack who was residing in Bristol, and was consulted by vast numbers of patients of all descriptions, high and low, and with all complaints. Having no great opinion of such practitioners, it was some time before I would apply to him, "not having faith as a grain of mustard seed;" but ultimately I thought that if he did me no good he might do me no harm, as after receiving his prescription, and paying his fee, I could follow his advice or not, as I thought proper. I went. The ante-room was full, and I had to wait my "turn," and then his advice was to take a table-spoonful of *mustard-seed* night and morning, in a cup of water or tea, or in any other way in which I found it most easy to swallow. Always preferring taking medicine in pills, after the first spoonful or two I began to swallow it, dry, at a mouthful, which I continued doing, I should think, until I had taken more than a pound weight of it, when one day I began to feel my blood tingle from head to foot, and I determined to desist from taking any more at that time, with the intention of renewing the remedy when needed, as I had found benefit from it from the first; but I suppose that this was the *happy crisis*, for from that time to this I have never been troubled with the rheumatic complaint, and therefore have had no further occasion so to do, my head being perfectly free from the pain ever since.

Remembering now the suffering I endured, I think it my duty to make this statement, the length of time which has since elapsed I think fully justifying me in doing so, and in your excellent *Lancet*.

I am, Sir,
Yours respectfully,
Philanthropist.

Bristol, May 9, 1843.

ANTIRACHITIC SYRUP.

BY DR. VANIER.

℞ Skate liver oil	125	gram.
Extract of walnut leaves	45	,,
Honey	735	,,
Distilled water	6	,,
Iodide of potassium	6	,,
Syrup of quinquina	375	,,
Simple syrup	1125	,,
Essence of aniseed	240	centigr.

M. & F.S.A.

In this syrup, the author not being able to raise sufficiently high the dose of the skate liver oil, the taste of which it is especially required to disguise, is obliged to augment the action of this oil, by associating with it different substances which appear to act in an almost analogous manner in the same affections: it is for this reason that we find among the constituents of this medicine, the extract of walnut leaves, the iodide of potassium, and the syrup of quinquina.

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[*] *American Journal of Med. Science*, Jan. 1843.

[†] *The Lancet*, May 20, 1843.

[*] *Clinique des Hôpitaux des Enfans.*

This syrup is administered to children, in the different forms of scrofula, in the dose of several spoonfuls, before breakfast.

NAPHTHALINE IN THE TREATMENT OF PSORIASIS AND LEPRA VULGARIS.*

BY M. EMERY.

THIS substance has been employed with success by M. Emery, in the treatmeut of psoriasis and lepra vulgaris, twelve cases out of fourteen in which it was tried having been entirely cured by its use. M. Emery recommends its application to the skin in the form of an ointment, composed of from 1 to 2 drachms of naphthaline to an ounce of lard. Considerable irritation is sometimes produced; but this seems to be readily allayed by emollient affusion and cataplasms; and the remedy usually affects a cure in a few weeks or months. No particular course of diet is required.

PREVENTION OF SORE NIPPLES.†

MR. MARCUS recommends as a means of preventing sore nipples, washing these parts and also a great portion of the mamma, three times a day, commencing from the sixth month of pregnancy, with tar water.

NATURE OF THE FAT SUBSTANCE OF MILK ‡

M. ROMANET asserts that the globules of milk are entirely formed of butter, which exist as a pulp, enveloped in a white, translucent, elastic, and resistant pellicle; and that this cyst is broken in churning, by which the butter is allowed to escape, and the pellicles floating about separately constitute the white particles which give consistence to the buttermilk.

PREVENTION OF VARIOLOUS OPHTHALMIA.§

BY DR. ALLE.

NEUMANN recommended a solution of ten grains of camphor in two drachms of sulphuric ether, applied by means of compresses repeatedly wetted with it, as an effectual means of causing the pustules of small-pox to abate. Dr. Allé has employed it successfully to the eyelids. He found that the stigmata went no farther than this their first stage, and that the swelling of the eyelids did not occur. When the pustules were somewhat farther advanced, they still never came to maturity, but soon dried up into little crusts, the pocks in the places where no application was made, running their usual course.

PHOSPHORUS AS A CURE FOR PARALYSIS OF THE TONGUE.*

A MAN, aged 45, after having been several times affected with syphilis, and having been treated in the last instance by corrosive sublimate, according to Dzondi's method, was affected with a hæmiplegia which obstinately resisted the alcoholic extract of nux vomica, strychnia, quinquina, arnica, and exsutories.

When Dr. Jankowitz began to attend this patient, the paralysed extremities had regained a little mobility; but the face was drawn to the left, the eye of the same side remained closed, the speech was unintelligible, and the tongue could not be directed from the left side; the circulation was slow, the respiration painful and stertorous; the motions of deglutition caused cough, nausea, and vomiting.

Thinking that these symptoms were dependent on latent syphilis, he induced the physician to prescribe iodide of potassium, and 60 grammes of this substance were taken by degrees. Under the influence of this treatment, the state of the patient was not much improved, and the symptoms gave way but little, with the exception of the difficulties of respiration and of articulating sounds. He then returned to the use of strychnia by the endermic method, and to that of quinquina and arnica, but without the least advantage. Dr. Jankowitz then determined to resort to the use of phosphorus, which he prescribed in the following manner:

℞ Phosphorus	10 centigrammes
Essential oil of turpentine	24 decigrammes
Dissolve; then add—	
Volatile oil of calamus . .	12 decigrammes
Sulphuric ether . . .	8 grammes

The patient at first took six drops of this mixture every two hours, on a lump of sugar; afterwards the dose was increased with much circumspection, and progressively raised to 26 drops. By means of this energetic treatment, complete cure was obtained in the space of five weeks, Dr. Jankowitz adds that, during this time, 70 centigrammes of phosphorus were swallowed.

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* From *The Lancet*, March 18, 1843.

† *Journal de Chimie Médicale*, May, 1843.

‡ *Journal de Connaissances Méd. Prat.* Feb. 1843; and *American Journal of Medical Sciences*, January, 1843.

§ *Comptes Rendus*, April 4, 1842; and *American Journal of Medical Science*, Jan. 1843.

* *Oesterreich. Medicin. Wochenschrift.*

REVIEW.

MAGNETICAL ADVERTISEMENTS, OR DIVERSE PERTINENT OBSERVATIONS, and Approved Experiments, concerning the Nature and Property of the Loadstone; very pleasant for Knowledge, and most needful in Practice, of Travelling, or for the framing of Instruments fit for Travellers both by Sea and Land. By William Barlowe. A New Edition, with Notes by William Sturgeon, Lecturer to the Manchester Institute of Natural and Experimental Science. London: Sherwood, Gilbert and Piper. 1843. 12mo. pp. 76.

Of this work, we have but little to say, beyond mentioning the fact that it is a new edition of a very old but good book, by a man who, in his day, ranked high among philosophers. Mr. Sturgeon has adapted the style to the present age, and has executed the duty of editor with faithfulness and ability.

We recommend the perusal of this little work to all of our readers, and we promise them much gratification if they act on our recommendation.

TO CORRESPONDENTS.

Mr. Overton is thanked for his communication, which shall be answered by post.

Mr. W. Onion's communication is under consideration.

"Veritas."—Your request shall be attended to.

T.—We are glad to find that our Addresses to the Pharmaceutical Chemists of this country are taking effect. We have daily received an immense number of letters from members about to secede from the Pharmaceutical Society; as we do not feel at liberty to disclose their names, we are compelled thus generally to applaud their sensible resolution.

To suit the convenience of such of our readers as may wish for answers to questions sooner than can be obtained through the "Notices" in our Journal, we have determined on the following. Letters sent *before* the 10th of each month will be answered on that day by private letter; those which are sent after that time, on the 20th; after the 20th, letters will be answered in the Monthly No., or privately, on the 1st. Correspondents must send us their names and addresses; or initials, and the post-offices of their districts will do. As this arrangement is for the benefit of our readers, postage stamps should be enclosed when private letters are requested in reply.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN APRIL, 1843.

BY E. THOMPSON.

BAROMETER.

Monthly mean	29·64
Mean at 9 A.M.	29·60
Mean at 3 P.M.	29·60
Mean at 9 P.M.	29·63
Maximum on 14th	29·99
Minimum on 8th	29·20
Range	·79

THERMOMETER.

Monthly mean	47°
Mean of maxima	55
Mean of minima	40
Maximum on 29th	70
Minimum on 10th	30
Range	40

WIND.

	Days.		Days.
N.	0	S.	1
N. E.	1	S. W.	5
E.	2	W.	13
S. E.	3	N. W.	4

RAIN.

1·79 inches.

WEATHER.

	Days.		Days.
Clear	3	Frost	3
Cloudy	7	Lunar halo	0
Overcast	1	Mist	0
Shower	12	Hail	0
Continued rain	3	Lightning	0
Snow	4	Thunder	1

GENERAL REMARKS.

This month, at its beginning and end, has been warm; in the middle, frost and snow prevailed. The pressure of the atmosphere throughout has been very steady, and the rain fallen has not been in large quantity. The weather, upon the whole, has been favorable to vegetation, and the young corn is said to look extremely well. Fevers and Rubeola have been common.

Nota Bene.—*All Communications and Books for Review must be addressed "To the Editors of the Chemist, Care of Mr. Hastings, Publisher,* 13, *Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON THE OXYGENOUS COMPOUNDS OF CHLORINE.*

BY M. E. MILLON.

I HAVE had the honor of announcing to the Academy the existence of a new acid compound of chlorine and oxygen, possessing the formula $\mathrm{Cl\,O^3}$. This acid, which I call *chlorous acid*, forms an entirely new series of salts whose properties I have examined in the Memoir which I now submit to the Academy.

In studying the acid itself, in the free state, I produced another compound of chlorine and oxygen. This is a new compound which forms a kind of complex acid, of the nature of hyponitrous acid, and which is decomposed, in contact with bases, into chlorous and perchloric acids. It is regularly produced only under the influence of the most vivid solar light, whose temperature must not exceed $+20°$ C. The solar light of the morning answers better than that of the evening. In this transformation, chlorous acid, which is a gas, is converted into a liquid of a very deep red-brown, which is no longer detonating, like the gas which furnished it, and which, in contact with humid air, gives out vapors which are so thick that a few drops will render a recently washed room quite cloudy. This property has given me the explanation of the thick cloud which chlorous acid itself, dissolved in water, and, consequently, already saturated with humidity, spreads in a large bottle. These very dense vapors are due to the new compound which I am noticing; chlorous acid slowly produces it, being transformed, particle by particle. But the transformation goes farther: this compound, which I designate by the name of chloroperchloric acid, is converted into perchloric acid when the temperature which accompanies the solar light is not moderated, or when it is kept for a long time, even sheltered from the light.

Chlorous acid likewise gives rise, in the latter case, to perchloric acid.

When the operation is performed in very dry flasks, their sides are covered with fine crystals of anhydrous perchloric acid.

The composition of chloroperchloric acid is expressed by $\mathrm{Cl^3\,O^{17}}$; this constitution, which appeared to me inadmissible, and which I accepted only after decisive experiments, caused me to recur to the examination of the products which are formed in the action of hydrochloric acid on chlorate of potassa. I was able to separate from it a liquid whose boiling point differs from that of hypochloric acid, and which has, indeed, a different formula, represented by $\mathrm{Cl^3\,O^{13}}$. This compound, like the preceding one, does not combine with alkaline bases: it is separated, by their contact, into chlorous and chloric acids, furnishing twice as much chlorate as hypochloric acid. It may be distinguished under the name of chlorochloric acid.

In an early Memoir, I shall give the result of my researches concerning the decoloring compounds formed by chlorine and by the combination which has been designated by the name of *hypochlorous acid*.

Laying aside these last compounds, and returning to the acids formed by chlorine and oxygen, we have the following series:—

$\mathrm{Cl\,O^3}$	chlorous acid;
$\mathrm{Cl\,O^4}$	hypochloric acid;
$\mathrm{Cl^3\,O^{13}}$	chlorochloric acid,
$\mathrm{Cl\,O^5}$	chloric acid;
$\mathrm{Cl^3\,O^{17}}$	chloroperchloric acid;
$\mathrm{Cl\,O^7}$	perchloric acid.

But it is evident, at the first glance, that if some of these compounds enter with difficulty into the ordinary law of chemical proportions, two of them sensibly deviate from it. $\mathrm{Cl^3\,O^{13}}$ and $\mathrm{Cl^3\,O^{17}}$ constitute quite new numerical relations, which ought not to be installed in the midst of the very simple numbers of mineral chemistry, without a careful examination. This relation between chlorine and oxygen presents likewise the inconvenience of putting out of mind the very clear reactions which belong to these combinations, and which are similar to the other compounds of chlorine and oxygen.

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* *Comptes Rendus*, No. 15, April 10, 1843.

I endeavored to remove these anomalies; I found the means of doing so in the very reactions of these new compounds. The principles which guided me seem to be applicable not only to the oxygenous compounds of chlorine, but also to the compounds of oxygen with the principal metalloïds. These principles introduce such a simplicity of classification, that the combinations of chlorine with oxygen, on being multiplied, have returned, if I may use the term, to unity of composition. It is the same with the combinations of nitrogen and those of sulphur, whose number is daily increasing, and whose nomenclature will very soon escape the best memory.

One of the first points which it is easy to establish, is that by applying to the oxygenous compounds of chlorine the principle developed by Proust on the subject of the complex oxides, called saline oxides by Dumas, and by representing all these combinations by the union of the least oxygenous acid, $Cl\,O^3$, with the most oxygenous acid, $Cl\,O^7$, we have the following series :—

$Cl\,O^3$ chlorous acid;
$Cl\,O^7$ perchloric acid;
$Cl\,O^3 + Cl\,O^7 = 2Cl\,O^5$ chloric acid;
$2Cl\,O^3 + Cl\,O^7 = Cl^3\,O^{13}$ chlorochloric acid;
$3Cl\,O^3 + Cl\,O^7 = 4Cl\,O^4$ hypochloric acid;
$Cl\,O^3 + 2\,Cl\,O^7 = Cl^3\,O^{17}$ chloroperchloric acid.

It must be remarked that this mode of representing the formulæ of the acids of chlorine is in relation with their principal reactions, and immediately calls to mind their properties; thus the action of energetic bases is immediately found to be indicated, and, which is a remarkable thing, it is the same with the powerful acids. Sulphuric and nitric acids, in their highest state of concentration, destroy all the intermediate combinations of chlorine and oxygen, and reduce them to two primitive acids, to the two extreme constitutions, chlorous and perchloric acids.

This disposition of formulæ serves also to explain the production of perchlorate of potassa at the expense of the chlorate, under the influence of heat. The simultaneous action of oxidation and of deoxidation which is manifested in the distillation of the chlorate is opposed to the ordinary rules of chemistry: this action becomes a simple phenomenon of disassociation, in which the chlorine which pre-existed in the constitution of the chlorate is found destroyed before the perchlorate. By extracting only the quantity of oxygen which corresponds to the chlorite, a greater residue of perchlorate is obtained than was indicated by Serullas and Liebig. But it was difficult to seize the limit otherwise than by this theoretical valuation, for the perchlorate itself produces chlorate before being entirely converted. These phenomena also accord with the general decomposition of the chlorites, the most stable of which do not resist a temperature of 570° Fahr.

Without pretending to fix the intimate arrangement of the elements which constitute compound bodies, there must always be recognised in them certain predispositions which establish general relations between very numerous and very various bodies. The ignorance of that predisposition obscures all reactions and throws into a confusion all chemical combinations.

The rational formula which I propose for the oxygenous compounds of chlorine accommodates itself to their most striking reactions; in all these combinations the chlorous and perchloric acids are incessantly reproduced. Free or combined, they compose the two terms from which the other acids set out or else by which they are bounded.

But it is possible to simplify this still further by the intervention of the groupings, the principle of which Regnault made known in his experiments on the ethers.

Regnault, in a long series of experiments, has given the most complete demonstration of the persistence of the same molecular number, and of the modifications which it may experience by the introduction of elements of variable nature. His discovery of chlorosulphuric acid, $So^2\,Cl$, that of iodosulphuric acid, $So^2\,I$, which has since been made, have likewise demonstrated that the mineral groupings persist in the same manner, and are modified in the same manner. Finally, in the interpretation which Regnault has given of acetal and methylal, it may be conceived how two or three molecules of the same grouping, some modified by oxidation, others intact, remain united and present, with a very complex appearance, a simple and easily comprehended constitution.

All these facts find their application in the oxygenous compounds of chlorine; they introduce into them their character of simplicity and of high generalisation. Thus, in two words, perchloric acid, a grouping of chlorine and oxygen alone, is modified by the introduction of an equivalent of chlorine into the place of an equivalent of oxygen; chlorous acid, $Cl\,O^6$, $Cl = 2Cl\,O^3$, is thus obtained; and the whole series of combinations of chlorine with oxygen is expressed by the union of several molecules of perchloric acid, some of which are modified by the presence of chlorine replacing oxygen, whilst others remain intact.

The complex molecules are exposed in their reactions; the simple molecules are modified and afterwards combine with one another: such is the correct and summary history of all the combinations of chlorine and oxygen.

If it be sought to apply these principles to the acids of sulphur and nitrogen, we obtain—

$S\,O^3$ sulphuric acid; primitive compound.
By replacing 1 eq. of oxygen by 1 eq. of sulphur,
$SO^2\,S$ hyposulphurous acid;
$SO^3 + SO^2\,S = S^3\,O^5$ sulphuretted hyposulphuric acid;
$2SO^3 + SO^2\,S = 4S\,O^2$ sulphurous acid;
$2SO^3 + 7SO^2\,S = 4S^4\,O^5$ bisulphuretted hyposulphuric acid;
$6SO^3 + SO^2\,S = 4S^2\,O^5$ hyposulphuric acid;
$SO^2\,Cl =$ chlorosulphuric acid;
$SO^2\,I =$ iodosulphuric acid;
$SO^3 + SO^2\,Cl =$ chlorobisulphuric acid;

Nitric acid, NO^5, is the primitive combination of the acids of nitrogen; but to replace the oxygen by nitrogen, it is necessary to restore to the latter an equivalent value equal to 3 eq. of oxygen.

We have thus the following series:—

NO^5 nitric acid;
$NO^2\ N = 2NO$ protoxide of nitrogen;
$NO^5 + NO = 4NO^3$ nitrous acid;
$NO^5 + 3NO = 4NO^2$ deutoxide of nitrogen;
$3NO^5 + NO = 4NO^4$ hyponitric acid.

If these principles are well founded, we may yet expect to discover many new compounds of sulphur, chlorine or nitrogen, with oxygen; it must also be expected to make other metalloïds enter into perchloric and nitric acids.

These principles would then have the advantage of classing the already very numerous facts which exist, and of keeping a place quite ready for the acquisitions which, in the present arrangement of chemical classifications, would seem of a nature to introduce incumbrance.

ON THE SULPHURETS OF PHOSPHORUS.*

EXTRACT OF A LETTER FROM BERZELIUS TO PLANTAMOUR.

Stockholm, February 22, 1843.

. . . . I HAVE just terminated my investigations concerning the sulphurets of phosphorus, and send you a brief recapitulation of them, before the printed Memoir is ready to be sent to you.

Phosphorus produces with sulphur the same compounds as with oxygen, and one more which contains a larger quantity of sulphur. It happens here, as with oxygen, that the combination of two elements in the inferior compounds is operated at a rather low temperature, and without being accompanied by an appreciable disengagement of heat. It is in these circumstances that $P^4\,S$ and $P^2\,S$ are formed: the first is liquid and colorless sulphuret of phosphorus; the second is that which is liquid and yellow, and which you prepared in my laboratory, with the view of controlling Dupré's experiments. The crystals which are obtained when sulphur is dissolved by means of heat in the latter, do not contain $P^2 + 6S$, as Dupré supposed, but $P^2 + 12S$. Below 212° F., it does not form other combinations. But at a higher temperature, although, indeed, not much higher, the phosphorus burns at the expense of the sulphur, just as if it were burning in rarefied air, in order to form $P^2\,O^3$, and in ordinary air or in oxygen to form $P^2\,O^5$. If the sulphur be in sufficient quantity, $P^2\,S^5$ is produced. As the sulphur and phosphorus are previously in fusion when this phenomenon of combustion takes place, and as, moreover, the sulphuret of phosphorus is volatile, the combination is accompanied by a violent detonation, analogous to that of fulminating silver. You have here the explanation of the accident which I mentioned to you in my last letter,* and which has been attended with disastrous consequences. I have not immediately found the cause of it; but in examining the tubes in which I detonated the sulphuret *in vacuo*, I found them lined with a sulphuret of phosphorus different from those which I had previously prepared, and which was the sulphuret of phosphorus containing more phosphorus than any of the others; I should, indeed, have supposed, *à priori*, that phosphorus would produce $P^2\,S^5$ only when the combination was attended with combustion.

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* *Bibliothèque Universelle de Génève*, No. 87, April 25, 1842.

* *See* THE CHEMIST, No. XLI., May, 1843, p. 209.

All these sulphurets, with the exception of $P^2\,S^{12}$, combine in the dry way with sulphobases to form peculiar sulphosalts; but the inferior compounds, such as $P^4\,S$ and $P^2\,S$, pass by this operation to a different isomeric modification, in which they are solid, pulverulent and red, and so much the more red as they contain more phosphorus. It is not alone the temperature that brings about this change, but a catalytic influence is simultaneously exerted by a powerful sulphobase, for the portion of the sulphuret which does not enter into combination likewise passes to the state of the red modification. An alkali converts the greatest part of the excess into the red modification, sulphuret of manganese transforms a little, and sulphuret of silver none at all. These red bodies are not oxidised in the air, nor by boiling in water; when they are heated in a distilling apparatus, they become deeper, then black, but they resume their primitive red color on cooling. They do not enter into fusion, but they volatilise directly, producing by condensation the liquid combinations, which, exposed to the air, give out vapors and are oxidised. I have obtained $P^4\,S$ of a deep vermilion red, and inflammable at a rather low temperature, but however above 77°F.; $P^4\,S + P^2\,S$ is of the color of minium and inflames at about + 122° F.; and, finally, $P^2\,S$ is of an orange color, and inflames only at near 212° F.

$P^2\,S$ combines with bases in the same proportion as hypophosphorous acid $P^2\,O$; that is to say that 1 atom combines with 1 atom of sulphobase. $Mn\,S + P^2\,S$ is the most proper combination for preparing it; $Mn\,S$ is dissolved in hydrochloric acid with a disengagement of $H^2\,S$, and $P^2\,S$ is set at liberty and is not dissolved.

When hyposulphophosphite of manganese, $Mn\,S + P^2\,S$, is mixed with 2 atoms of sulphur, and when the mixture is heated in a current of hydrogen, a sublimate of sulphuret of phosphorus $P^2\,S^3$ is obtained, which $Mn\,S$ retains with only a very feeble affinity. If, on the contrary, hyposulphophosphite of silver, $Ag\,S + P^2\,S$, be treated in the same way, only half of $P^2\,S^3$ is sublimed, and there remains some sulphophosphite of silver, $2Ag\,S + P^2\,S^3$, a compound perfectly proportional to $2Ag\;O + P^2\,O^3$, which is phosphite of silver. $P^2\,S^3$ may also be obtained by heating a mixture of red $P^2\,S$ and 2 atoms of sulphur, and collecting the sublimate. At the commencement of the operation there is a feeble disengagement of heat. $P^2\,S^3$ is of a pale yellow; it is not crystalline; it is readily decomposed in humid air, and easily dissolves in the caustic alkalis and alkaline carbonates, from which they may be again precipitated by the acids.

The sulphuret of phosphorus, $P^2\,S^5$, is obtained without danger, by heating a mixture of red $P^2\,S$ or of $Mn\,S + P\,S$ and 4 atoms of sulphur; the sulphuret sublimes and crystallises. When the red $P^2\,S$ is employed, at the moment when the combination is operated, there is a disengagement of heat, but there is no danger, as there is when liquid $P^2\,S$ is used. $P^2\,S^5$ is of a pale yellow; in fine crystals it is but little colored; it is decomposed in humid air, and dissolves with the greatest facility in the caustic and carbonated alkalis; but the acids precipitate from those solutions only sulphur, and that even in less quantity than the sulphuret contained, which proves that it is decomposed when it is dissolved by the humid way in alkalis. I have prepared some sulphophosphates: sulphophosphate of silver, $2Ag\,S + P^2\,S^5$, is of a fine deep yellow; $2Hg\,S + P^2\,S^5$ sublimes in transparent and very slightly yellowish acicular crystals; $2Hg\,S + P^2\,S^3$ is decomposed by sublimation into a more volatile salt, $2\,Hg + P^2\,S^5$, and into another salt less volatile and basic, $2Hg\,S + P^2\,S$.

The formulæ of these salts are consequently:—

$RS + P^2\,S$ = hyposulphophosphites;
$2RS + P^2\,S^3$ = sulphophosphites;
$2RS + P^2\,S^5$ = sulphophosphates;

in which S may be exchanged for O to have those of the oxysalts.

I have not been able to obtain $P^2\,S^3$ nor $P^2\,S^5$ in more of an isomeric modification.

The inferior red modifications lead, as it appears to me, to a very true conclusion. We know two allotropic modifications* of

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* Perhaps it may not be out of place here to call to mind what Berzelius means by allotropic modification or state. He expressed himself in this respect, at the Second Congress of the Scandinavian *Savants*, at Copenhagen. (*See the Memoirs of the Congress*, Copenhagen, 1841.)

The word *isomeric*, which signifies composed of equal parts, is intended to designate the circumstance in which compound bodies are found, which are formed of the same elements and of the same relative numphosphorus, which are quite distinct (I leave apart the third, which is white), viz., the ordinary modification, which is very inflammable, the whitish yellow, transparent, which fumes and is oxidised in the air, and the red modification, which is produced by the solar influence, which does not fume in the air, and which passes by distillation to the state of the first modification. It is evident that the sulphurets, which are liquid, and which fume in the air, have for their radical ordinary phosphorus, whose properties they retain, and that, in the red compounds, red phosphorus is the radical. We have here, therefore, the most evident proof of isomeric modifications, which do not depend solely on a different grouping of their elementary atoms, but whose fundamental cause is the different allotropic state of the radical, which is met with in the properties of the combinations. If we apply what we have just said, to other compounds of phosphorus, it will result that the red oxide of phosphorus contains red phosphorus, and that the yellow oxide contains ordinary phosphorus. The latter becomes red by an elevation of temperature. It can scarcely be doubted that ordinary phosphoric acid contains ordinary phosphorus; hence the radical of pyrophosphoric acid must be red phosphorus. The phosphuretted hydrogens present in this respect still more interest. When ordinary phosphorus, and the liquid sulphurets of phosphorus, are treated by caustic potassa, they disengage a gas which does not inflame spontaneously. If the gas which inflames spontaneously be exposed to the rays of the sun, which convert phosphorus into red phosphorus, it will lose this property, which would seem to prove, consequently, that the gas which does not inflame spontaneously contains red phosphorus.

H. Rose has discovered two nitrurets of phosphorus, which are isomeric, but which differ in their properties. The one is white, and retains its whiteness during calcination; the other is whitish yellow, and becomes brown, even almost black, by calcination; but it resumes its primitive color on cooling; exactly the same phenomenon is presented by orange $P^2 S$, the radical of which is red phosphorus. It appears to me that these resemblances contain something more than mere probabilities.

ON A MEANS OF SEPARATING THE DEUTOXIDE OF CERIUM FROM THE DEUTOXIDE OF DIDYMIUM.*

EXTRACT OF A LETTER FROM PRINCE LOUIS-LUCIEN BONAPARTE.

I HAD for some time been occupied with the chemical study of several metallic valerianates, and of those of cerium in particular, when I became acquainted, through the scientific journals, with the discovery of didymium by Mosander. I have been so fortunate as to find, in valerianic acid, in concentrated solution, a means of separating the deutoxide of cerium, in the state of purity, from the deutoxide of didymium. Indeed, valerianic acid possesses a singular and unexpected affinity for the deutoxide of cerium, for it abundantly precipitates a concentrated and neutral solution of mixed nitrate of the deutoxides of cerium and didymium. The yellowish white precipitate is constituted of only valerianate of deutoxide of cerium, and it has only to be washed and calcined at a strong red heat, for the pure deutoxide of that metal to be produced. This oxide is of a very pale yellow, like that of Mosander, who, however, avows, that he

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ber of atoms, which have the same atomic weight, and which differ in their physical and chemical properties. This denomination can be applied, therefore, only to compound bodies.

Experience shows, however, that bodies which we have agreed in regarding as simple bodies, present, according to circumstances, different properties, the nature of which is very similar to those which isomeric bodies present among themselves, which has led some writers in this case to employ the term of isomeric modifications. Berzelius then mentioned hydrogen, sulphur, carbon and silicon, (phosphorus may now be added,) all simple bodies which present different states; and he proposed to designate this peculiar property of simple bodies, by the terms *allotropy*, or *allotropic state*, from the Greek word αλλοτροπος, which signifies that which is in a different state.

The isomerism of compound bodies may be due to three different causes, namely:—

I. A different allotropic state of one or more elements; for example, in yellow and white iron pyrites, it is evident that the iron is combined with the sulphur in different allotropic states.

II. A different grouping of the atoms of elements which concur to form the compound atoms, without difference in the state of the atoms; for example, the formiate of ethule and acetate of methule, contain each $6C + 12 H + 4O$, but the first is $C^4 H^{10} O + C^2 H^2 O^3$, and the second $C^2 H^6 O + C^4 H^6 O^3$.

III. A different allotropic state of the atoms, conjointly with a different grouping of the elements.

* *Comptes Rendus*, No. 18, May 8, 1843.

had not yet found an absolute means of separating the oxides of cerium, lantanium and didymium.

The oxide of didymium remains dissolved in the acid liquor, from which the valerianate of deutoxide of cerium has been precipitated. A portion of cerium is found, however, mixed with the didymium, for the valerianates of the two metals are rather soluble in water, and still more so in acid liquors, especially that of didymium, which is much more soluble in the weak acids than that of cerium. Pure oxide of didymium may, however, be obtained, by means of valerianic acid, although with much more difficulty than that of cerium. In an early Memoir, which I shall have the honour of presenting to the Academy, I will enter into the necessary details concerning the separation, preparation and properties of these two oxides, in a state of purity, such as I obtained them by means of valerianic acid.

I may conclude by observing that, in order to obtain the pure valerianate of deutoxide of cerium, from mixed nitrate of deutoxide of cerium and didymium, that salt must be precipitated by the concentrated aqueous solution of valerianic acid ; if a soluble valerianate were used, the didymium, which is very sparingly soluble in the state of valerianate in neutral liquids, would also be precipitated. It is, therefore, to the great solubility of the valerianate of didymium in acid liquors, and to the inferior solubility of that of deutoxide of cerium in these same liquors, that I owe the easy preparation of deutoxide of cerium in the pure state.

A DOUBLE SULPHITE OF THE PROTOXIDE OF PLATINUM AND SODA, A NEW SALT.*

BY A. LITTON AND SCHNEDERMAN.

This compound is formed, when a solution of the bichloride of platinum is saturated by sulphurous acid, and afterwards neutralising the fluid with the carbonate of soda. By this process is produced a very voluminous and almost colorless precipitate, which, as investigation showed, is a double salt of the sulphite of the protoxide of platinum and the sulphite of soda.

This salt is, when dry, an amorphous, white powder ; when moist, however, it has a yellowish tinge, which is the deeper the more the solution is concentrated, out of which it is precipitated. In cold water it is very slightly soluble. The solution is colorless, neutral, and leaves, by evaporation, a white, varnish-like mass. In warm water it is somewhat more soluble, since the warm saturated solution, upon cooling, becomes slightly turbid, and untransparent. In alcohol it is insoluble. From its solution in water it is precipitated, by the addition of the chloride of sodium, as a white, fleecy precipitate. It acts in a similar manner with many other, though not all salts, and the compound, when thus thrown down, is perfectly white.

One of the most remarkable properties of this salt is, that when dissolved in water, the presence of the platinum is not indicated by the usual tests. The solution remains unchanged upon the addition of hydrosulphuric acid and hydrosulphate of ammonia. Upon the addition of an acid, however, the salt seems to undergo decomposition, and the solution, even at the common temperature, is slowly colored; whereas, by heating, it immediately becomes brownish-red, and at length the sulphuret of platinum falls down. This precipitate is entirely soluble in the hydrosulphurets of the alkalis. The salt does not, however, seem to be decomposed by alkalis, as it is by acids.

By acids, even when diluted, this salt is easily decomposed, and, with the escape of sulphurous acid, dissolved. The solution in hydrochloric acid gives, when evaporated, crystals of chloride of sodium ; and upon the addition of ammonia, a green, and somewhat crystalline precipitate, the platino-protochloride of the hydrochlorate of ammonia. The solution in sulphuric acid gives, by evaporation, crystals of the sulphate of soda, and exhibits then the dark color of the sulphate of the protoxide of platinum. By a certain concentration of the acid, metallic platinum falls down ; a property which was found to belong to the sulphate of the protoxide of platinum purposely prepared. The solution of the salt in nitric acid assumes, upon evaporation, a brownish-red color ; if sal-ammoniac is then added, no precipitate is formed ; if, however, the solution is evaporated almost to dryness, and sal-ammoniac added, there is formed in abundance, the platino-bichloride of hydrochlorate of ammonia. The brownish-red color seems here to arise from the formation of the sulphate of the peroxide of platinum.

In a solution of the cyanuret of potassium, this salt is very soluble, and, by evaporation, crystals of the platino-cyanuret of potassium are obtained.

If this salt is exposed to the temperature of nearly 390° (Fahrenheit), it loses completely its water of composition. Heated to 464° F., it undergoes no further change, but when exposed to a still greater heat, it begins to suffer decomposition. This decomposition is completely effected by long exposure to a red heat, and a mixture of sulphate and sulphite of soda with metallic platinum remains behind.

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* Communicated by the Author to the *American Journal of Medical Science*, 1843.

In order to determine the quantity of the soda and the platinum, the salt was mixed with sal-ammoniac, and then exposed to a red heat. The residue, which consisted of platinum and the chloride of sodium, was washed with water, and to this water sulphuric acid was added, in order to determine the soda by weighing the sulphate of soda thus formed. In order to determine the quantity of sulphurous acid, a weighed portion of the salt was put into water, and through this chlorine conducted. From this, the sulphuric acid which was thus formed was precipitated by the chloride of barium. Of the salt dried at 390° (Fahrenheit)—

I. 1·850 grammes, gave 1·190 sulphate of soda, which is equivalent to 0·521 soda; and 0·543 platinum, equivalent to 0·587 protoxide of platinum.

II. 1·108 grammes, gave 0·328 platinum, =0·3546 protoxide of platinum.

III. 1·488 grammes, gave 0·954 sulphate of soda, =0·418 soda.

IV. 0·867 grammes, gave 1·234 sulphate of baryta, =0·3395 sulphurous acid.

V. 0·874 grammes, gave 1·249 sulphate of baryta, =0·3436 sulphurous acid.

These numbers give for the composition of the salt the following formula:—$3NaO\ SO_2 + PtO\ SO_2$; according to which, in 100 parts are contained:—

	Calculated	1.	2.	3.	4.	5.
Soda	28·53	28·18		28·09		
Protoxide of platinum	32·44	31·73	32·00			
Sulphurous acid . .	39·03				39·16	39·32

The salt when dried by 212° (Fahr.), lost, when heated up to the temperature 390° F., according to three different experiments, 3·90, 4·28, 4·16 per cent. of water. This gives for the formula of the salt containing water, $2\ (3NaO\ SO_2 + PtO\ SO_3) + 3\ HO$, according to which formula, the quantity of water reckoned amounts to 3·94 per cent. If protoxide of platinum is suspended in water, and sulphurous acid conducted through it, the former, although with difficulty, is gradually dissolved with a greenish brown color, and out of this solution the above described can be precipitated by the carbonate of soda.

When this double sulphate is dissolved in only so much diluted sulphuric or hydrochloric acid as is requisite for its solution, and the fluid by a low temperature evaporated, a yellow powder falls down, in proportion as the sulphurous acid escapes, which is also a compound of the sulphite of the peroxide of platinum with the sulphite of soda, but with a smaller quantity of the latter than the first described salt. Of this salt, after having been well washed and dried at 212° (Fahr.)—

I. 0·884 grammes, gave 0·306 sulphate of soda, =0·134 soda, and 0·410 platinum, =0·443 protoxide of platinum.

II. 0·443 grammes, gave 0·487 sulphate of baryta, =0·134 sulphurous acid.

These numbers correspond to the formula, $(NaO\ SO_2 + PtO\ SO_2) + HO$.

According to which the salt contains, in 100 parts:—

	Calculated	1.	2.
Soda	14·81	15·17	
Protoxide of platinum	50·53	50·13	
Sulphurous acid .	30·40		30·22
Water	4·26		

The quantity of water was not directly determined, but estimated from the loss. To obtain this salt in great quantity is difficult, because of its great solubility in water; and, consequently, when well washed in order to free it from all impurities, but little remains upon the filter. Its solution in water has an acid reaction, and is not precipitated by chloride of sodium, but in other respects, exhibits most of the properties of the first described salt, when treated with acids and alkalis.

ANALYSIS OF CARBONATE OF LIME WITH FIVE ATOMS OF WATER.*

BY M. BARRESWILL.

In a Memoir published in the *Annales de Chimie et de Physique*, Pelouze has indicated the composition of a combination of neutral carbonate of lime with five equivalents of water—a compound which was deposited from a solution of lime in sugar and water, exposed to the contact of the air. Since then the Prince of Salins Hortmar has described in Poggendorff's *Annalen*, an analogous salt, deposited on the internal sides of a copper tube. This salt, submitted to analysis, gave him the following numbers:—

Lime	29·54
Carbonic acid .	18·40
Water . . .	47·38
Foreign substances	3·38

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* *Journal de Pharmacie et de Chimie*, April, 1843.

Berzelius, who gives an account of this in his *Annuaire* for 1837, assigns to this salt the following composition :—

$2\ CaO^2\ CO^2\ 6HO + 4CaO\ CO^2\ 6HO$,

and adds that the salt of M. Pelouze has the same formula ; he bases himself especially on M. Pelouze having indicated that the carbonate of lime which he obtained had a slight alkaline reaction on litmus paper.

At the invitation of M. Pelouze, I have repeated his former analysis ; like him, I have obtained numbers which very nearly approach theory, and which admit of no other explanation than that which he has given.

Indeed, one hundred parts of hydrated carbonate of lime gave—

1 . . . 51·47 of dry carbonate
2 . . . 51·48 " "
3 . . . 51·39 " "
4 . . . 50·89 " "

Theory indicates 52·87. This difference arises from the impossibility of completely washing and drying the carbonate, without causing it to lose water of crystallisation. I could not find a sample which, after calcination, did not react on litmus, notwithstanding numerous washings with a large quantity of water. I have thus been led to ascertain whether the neutral carbonates of lime really restore the blue color of reddened litmus paper. I tried successively, artificial carbonate of lime, washed chalk, Iceland spar, and finally marble. All these varieties of carbonate of lime returned the blue color of reddened litmus paper.

ON THE ACTION OF CHLORINE ON CARBURET OF SULPHUR.*

BY HEINRICH KOLBE.

The action of these two bodies on each other, was, until now, very imperfectly known ; it was admitted that chlorine caused carburet of sulphur to undergo no alteration without the presence of water. No investigations concerning their reciprocal action at a high temperature had been published. This subject, however, merited a more attentive study, if it were only in the well-founded hope of arriving by this means at the formation of a carburet of sulphur corresponding to the protoxide of carbon—a combination hitherto unknown. It was at the invitation and under the direction of Professor Wöhler, that Kolbe sought to resolve these questions.

He began by studying the action of gaseous chlorine on sulphuret of carbon at a red heat. He passed a stream of completely dried chlorine into a vessel containing carburet of sulphur. The latter was then volatilised in the gas. He passed the mixture of the two gases through a porcelain tube, filled with pieces of porcelain to augment the surface, and he heated this tube to redness. He adapted to the other extremity a good refrigerant and condensing apparatus. There was collected in the course of the operation a red yellow liquid possessing the odor of chloride of sulphur, whose quantity was much greater than that of the carburet of sulphur employed. There did not appear to be any formation of another product, nor a separation of carbon in the porcelain tube.

The liquid thus obtained was, as a more attentive examination has shown, a mixture of chloride of sulphur and perchloride of carbon, $C\ Cl^4$, lately discovered by Regnault. Water gradually decomposes it into sulphur, sulphurous acid, hydrochloric acid and perchloride of carbon, which separates under the form of a heavy, colorless liquid, immiscible with water. To obtain the last body, the best plan is gradually to add to the mixture, in such a manner as not to produce an elevation of temperature, an excess of a solution of potassa or milk of lime ; to leave the whole in contact for a certain time, stirring frequently ; and finally, to submit it to distillation. The perchloride of carbon then distils in the state of purity, and in this manner may be obtained with facility, and in any quantity that may be desired. It is only necessary to take care that the chlorine be perfectly dry, because the presence of water gives rise to the formation of the volatile crystalline body, discovered by Berzelius and Marcet, and which may be regarded as a combination of chloroxide of carbon with chloro-hyposulphurous acid. Besides, it is not necessary to heat the carburet of sulphur ; it is volatilised precisely in the proportion which can be decomposed by chlorine. If its volatilisation be accelerated by heat, a portion escapes decomposition ; and it is afterward tedious and difficult to separate from it the perchloride of carbon ; the treatment by caustic potassa is the best means of arriving at it.

In order to leave no doubt as to the nature of this perchloride, Kolbe determined its boiling point, its specific gravity, and its composition, and the results perfectly agreed with those of Regnault. He found it composed of 8·4 per cent. of carbon, and 91·7 per cent. of chlorine. According to the formula $C\ Cl^4$ the perchloride of carbon contains 7·9 per cent. of carbon, and 92·1 per cent. of chlorine.

Thus, at a high temperature, the chlorine removes all the sulphur from the sulphuret of carbon, and the carbon combines with an equivalent quantity of chlorine.

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* *Annalen der Chemie und Pharmacie.*

The action is not the same at the ordinary temperature. If a few grammes of carburet of sulphur be poured into a spacious flask, filled with carefully dried gaseous chlorine, and if, after having hermetically sealed it, it be left to itself for several days or weeks, in darkness or in the sun, the color of the chlorine gradually disappears, and the carburet of sulphur is converted into a deep yellow liquid. On opening the flask a rarefaction is observed.

The liquid thus formed is a mixture of chloride of sulphur and of a new combination, hitherto unknown, of carbon, sulphur and chlorine, in such atomic proportions that it may be regarded as chloroxide of carbon, in which the atoms of oxygen are replaced by sulphur. Treatment with water decomposes it. There is, on one hand, a separation of the products of the decomposition of chloride of sulphur, and, on the other hand, of the new combination under the form of an oily body. It is isolated and freed from the acids formed by several distillations with water and a little magnesia. The most advantageous process for obtaining it consists in abandoning for several weeks, stirring frequently, carburet of sulphur with a mixture for the disengagement of chlorine, (peroxide of manganese and hydrochloric acid,) in a vessel hermetically closed, and in then submitting the mass to distillation.

The same body is also produced with the simultaneous formation of hydrochloric acid, if the vapor of perchloride of carbon be passed with hydrosulphuric acid through a glass tube heated to a moderate degree of redness.

This body is a yellow liquid, immiscible with water, of a very peculiar and powerful odor, extremely irritating to the eyes. Its specific gravity is 1·46, and its boiling point about 158° F.; but these numbers cannot be perfectly accurate, for the reason which will be given further on. It is not decomposed by water, nor by the acids, nor even by fuming nitric acid. The solution of caustic potassa slowly decomposes it, giving rise to the formation of a carbonate and of an alkaline sulphuret, and causes a separation of colorless perchloride of carbon. The action of dry ammoniacal gas and of alcohol on this body should form the subject of a particular study.

The samples submitted to analysis were treated several times with water, and dried by means of chloride of calcium. The author obtained in 100 parts:—

Carbon	10·72
Chlorine . . .	56·76
Sulphur	32·16
	99·64

It is impossible to deduce immediately by calculation any formula from these numbers; but, if we reflect that the action of chlorine on carburet of sulphur at the ordinary temperature is very slow, and that it is very difficult to decompose the last portions of carburet of sulphur, it may with great probability be admitted, that the product submitted to analysis still contained a small quantity of carburet of sulphur in the state of mixture. Indeed, if, setting out from the proportion of chlorine found, the other elements be calculated according to the formula $CS\,Cl^2$, which the mode of formation and of decomposition of this body renders probable, we have—

Carbon	9·72
Chlorine . . .	56·76
Sulphur . . .	25·79
	92·27

If these numbers be subtracted from those given above, 1·0 carbon and 6·37 sulphur remain, thus expressing very nearly the composition of carburet of sulphur. But other experiments are required for the solution of this question. Let us, however, admit Kolbe's opinion as confirmed: this body would then be the combination of sulphur, analogous to the chloroxide of carbon, and its composition would be expressed by the formula $CS\,Cl^2$. In order to give rise to it, the chlorine would have removed from the sulphuret of carbon half of its proportion of sulphur, which would have been replaced by an equivalent of chlorine. It may, however, with more probability be admitted, that the decomposition is operated in the same manner as at a high temperature (that, consequently, all the sulphur is removed), but with this difference nearly with the ordinary temperature, that here the chloride of carbon which is formed enters into combination with an equivalent of carburet of sulphur left intact. It would therefore be necessary, in order to express the true composition of this body, to double the preceding formula, and to consider it as a combination of hyperchloride of carbon with sulphuret of carbon, $= C\,Cl^4 + CS^2$. The explanation of its decomposition by the alkalis, agrees more simply with this view.

ON THE PREPARATION OF PEROXIDE OF URANIUM.*

BY M. MALAGUTI.

Peroxide of uranium has never been isolated. The action of alcohol on the nitrate of uranium presents a sure and easy means of obtaining it in the state of hydrate, and of extreme purity.

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* *Comptes Rendus*, No. 16, April 17, 1843.

Make a solution of very pure nitrate of peroxide of uranium in absolute alcohol, and evaporate gently, in order that the liquid may not boil. As soon as the mass is reduced to a certain point of concentration, a tumultuous motion is manifested, and nitrous ether and nitrous vapor, accompanied by a decided odor of aldehyd, and formic acid, are disengaged. The residue of this violent reaction is a spongy, orange-yellow mass, which water separates into two substances, one of which is soluble, (undecomposed nitrate,) and the other insoluble, of a fine canary-yellow, which, washed with boiling water, until it no longer has an acid reaction, presents the composition of peroxide of uranium plus 1 equivalent of water = $U^3 O^3$, HO.

The density of the hydrated peroxide of uranium, determined at the temperature of +15° C., is = 5·926. Heated in a tube closed at one extremity, it disengages water, which has no acid reaction, and becomes more or less brown, according as it has been more or less heated. Weak nitric acid dissolves it without heat with great facility, without any phenomenon indicating any alteration whatever in the active matters. The acid solution, suitably evaporated, gives crystals of nitrate of peroxide of uranium. It was in vain that I endeavoured, by calcination, to ascertain the quantity of water contained in this oxide. Although I followed the precautions indicated by Péligot, in his work on Uranium, I always obtained variable mixtures of the olive and black oxides; a circumstance which, rendering doubtful the quantity of oxygen driven off by calcination, prevented me from estimating, by calculation, the real quantity of water. I was obliged to have recourse to direct apportioning.

The process consists in passing a current of dry air over a known quantity of oxide, heated by a large spirit lamp. The water which is disengaged is absorbed by chloride of calcium previously weighed.

EXPERIMENT I.

Oxide of uranium dried at 212° Fahr . .	0·911$^{\text{g.}}$	
Idem, after calcination over the lamp .	0·844	
Chloride of calcium	21·834	Difference represented by water =0·056=6·36 per cent.
Idem, after calcination of the oxide .	21·890	

EXPERIMENT II.

Oxide of uranium at 212° F.	1·020$^{\text{g.}}$	
Idem, after calcination	0·946	
Chloride of calcium	21·801	Difference represented by water =0·062=6·07 per cent.
Idem, after calcination	21·863	

EXPERIMENT III.

Oxide of uranium at 212° F.	1·485$^{\text{g.}}$	
Idem, after calcination	1·361	
Chloride of calcium	21·971	Difference represented by water =0·089=6·00 per cent.
Idem, after calcination	22·060	

			Calculated.
Which gives as the mean of the water .	6·11	per cent. = HO =	5·88
And as the mean of the anhydrous oxide .	93·89	„ = $U^2 O^3$=	94·12
	100·00		100·00

It is evident that, in each experiment, the total loss suffered by the oxide is much more considerable than the increase experienced by the chloride of calcium; which indicates that with the water a portion of oxygen was driven off.

I endeavored, by employing a bath of fusible alloy, to remove the water from the oxide, by the application of a more regular temperature, and thus to obtain the anhydrous oxide; at 750° F., I could drive off only one third of the water; at a higher temperature there was a loss of oxygen without a complete elimination of the water.

I thought it useless to analyse this oxide with hydrogen; for the perfect neutrality of the water disengaged by calcination, and the manner in which the oxide acts when it is put in contact with weak nitric acid, exclude all idea of a new degree of oxidation of uranium, or of the presence of a subsalt.

Finally, I should add that the oxide which served for the above three experiments, was the product of three different preparations.

ON CERTAIN COMPOUNDS OF CHROME.*

BY M. LÖWEL.

M. Löwel, formerly a pupil of M. Chevreul, who for more than twenty years has directed the chemical portion of M. Hartmann's manufactory of printed calicoes, at Munster, near Colmar, has addressed a letter to M. C., dated March 5, 1843, in which he makes some remarks relative to some propositions made by M. Malaguti.† These remarks were suggested to M. Löwel by a work on Chrome, so far back, to M. Chevreul's knowledge, as the year 1825, and in which there are some very interesting experiments on oxide of chrome.

When tartaric acid and bichromate of potassa react, an uncrystallisable green liquor is produced, which M. D. Köchlin took for a solution of *chromite of potassa.*

M. H. Löwel, in 1827, combated this opinion in a letter addressed to M. D. Köchlin. He considered this solution as that of three salts of potassa, in which the potassa is saturated by tartaric, oxalic, and formic acids, each united to oxide of chrome.

M. Löwel regards the reaction of bichromate of potassa and tartaric acid as more complete than M. Malaguti says; but he thinks, with that chemist, that tartaric acid constitutes, with oxide of chromium, not a salt, but a *complex acid.*

According to M. Löwel, the reaction of bichromate of potassa and oxalic acid is very simple: there are produced only carbonic acid, and a double salt of oxalate of chrome and oxalate of potassa, of a violet color, crystallising with at least 10 atoms of water, and not with 8, as stated by M. Malaguti.

M. Löwel does not admit, therefore, like M. Malaguti, that oxalic acid, in uniting with oxide of chromium, forms an acid analogous to that which results from the union of the same oxide with tartaric acid.

ON OLIVILE.‡

BY A. SOBRERO.

Olivile, discovered and analysed by M. Pelletier, in 1816, may very easily be obtained by first submitting the resin of the olive-tree, reduced to powder, to treatment by ether; afterwards dissolving the residue in boiling alcohol, and allowing the filtered solution to crystallise by cooling: it is easily freed from the resinous matter with which it is contaminated, by washing it on a filter with cold alcohol, which dissolves only a small portion of it, and leaves it perfectly white. By redissolving it, and crystallising it *de novo*, it is obtained in small, brilliant, radiated needles.

Olivile dissolves very well in alcohol and in water, and crystallises in both vehicles; it also dissolves in ether, but in small quantity, and in the volatile and fixed oils.

Olivile, like lithofellic acid, silvic acid, and other substances, presents the phenomenon of a different fusibility, according to whether it is crystallised or amorphous. When it is in crystals, its point of fusion is 268° F.; it acquires by fusion, a resinous aspect, and neither loses nor gains in weight; it does not lose its transparency by cooling; it is divided, without resuming the crystallised structure; its point of fusion is then 158° F. By dissolving it in alcohol and crystallising it again, it returns to the former point of fusion, namely, 268° F.

Olivile may be anhydrous, monohydrated, or bihydrated. Anhydrous olivile may be obtained by crystallising it in anhydrous alcohol, or by fusing the olivile crystallised in water. Its composition leads to the formula $C^{28} H^{18} O^{10}$ (in equivalents).

Crystallised in water, and dried in the vacuum of the pneumatic machine, by the side of sulphuric acid, until it loses no more in weight, olivile retains 1 equivalent of water, of which it can be deprived only by fusion. Its composition gives the formula $C^{28} H^{19} O^{11}$.

When olivile is crystallised in water, and pressed between folds of filtering paper until it is pulverulent and dry to the touch, it retains 2 equivalents of water; it has then the composition indicated by the formula $C^{28} H^{20} O^{12}$.

Olivile may be combined with oxide of lead by indirect means; it gives a salt whose composition represents 1 equivalent of anhydrous olivile and 2 equivalents of oxide of lead $= C^{28} H^{18} O^{10} + 2PbO$.

The composition of olivile, given by M. Pelletier, does not agree with any of those which are here indicated: this chemist had given for this body the formula in atoms $C^{12} H^9 O^2$, and the composition in hundredths of 63·84 of carbon, 8·06 of hydrogen, and 28·10 of oxygen. None of the three states of olivile which I have noticed gives such a composition.

ON THE COMPOSITION OF CERTAIN FATTY ACIDS.*

BY M. A. LAURENT.

Five years ago I presented to the Academy the following theory concerning the fatty acids :—

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* *Comptes Rendus*, No. 16, April 17, 1843.

† See The Chemist, No. IV., N. S., April, 1843, p. 161.

‡ *Journal de Pharmacie*, April, 1843.

* *Comptes Rendus*, No. 16, April 17, 1843.

Every fatty acid is derived from a hydrocarbon, containing equal atoms of carbon and hydrogen.

In the anhydrous fatty acids, the number of the atoms of hydrogen approaches considerably the number of the atoms of carbon; but it does not reach it, and never exceeds it.

If we add to the hydrogen as much oxygen as is necessary for forming a sum of atoms equal to that of the atoms of carbon, we always find a few atoms of oxygen in excess.

I now apply this law to some fatty acids.

Steäric acid .	$C^{68} H^{66} O + O_{\frac{3}{2}} + H^{2}O$
Margaric acid	$C^{68} H^{66} O + O^{2} + H^{2}O$
Cetic acid . .	$C^{64} H^{62} O + O^{2} + H^{2}O$
,, ,, . .	$C^{60} H^{58} O + O^{2} + H^{2}O$
,, ,, . .	$C^{56} H^{54} O + O^{2} + H^{2}O$
Œnanthic acid	$C^{28} H^{28} O + O + H^{2}O$
Œnanthylic acid	$C^{28} H^{26} O + O^{2} + H^{2}O$.

I have just repeated the analysis of some of these compounds: it results from it that steäric, margaric, and elaïdic acids have not the formulæ which are now assigned to them.

The elaïdic acid which I used was perfectly crystallised in oblique tables of one square inch of surface. The following are the formulæ which I have found :—

Steäric acid . . .	$C^{68} H^{68} + O^{4}$
Elaïdic acid . . .	$O^{72} H^{68} + O^{4}$.

With regard to margaric acid, I have not been able to decide whether its formula should be

$$C^{68} H^{68} + O_{\frac{9}{2}} \text{ or } C^{68} H^{67} O_{\frac{1}{2}} + O^{4},$$

that is to say, whether margaric acid is steäric acid plus half an equivalent of oxygen, or whether this half equivalent of oxygen has replaced half an equivalent of hydrogen.

INVESTIGATIONS CONCERNING THE OIL OF GAULTHERIA PROCUMBENS.*

BY M. A. CAHOURS.

A FEW years ago some discussions were raised concerning various points of theory relative to organic chemistry, in which the public did not always take the interest which those who raised them attached to them; but every one agrees in regarding as a fortunate event for science, the artificial formation of certain natural products, by processes of sure employment in the laboratory. Such is the situation in which I now find myself, in making known to the Academy the first results of my investigations concerning an oil recently employed in perfumery, and which is produced by a plant of the family of the heaths, the *Gaultheria procumbens.*

The oil furnished by this vegetable is heavier than water, sparingly soluble in that liquid, and almost entirely formed of a substance which boils exactly at the temperature of 435° F., without undergoing decomposition.

I have made three analyses of this product, which have led me to the following results :—

I. $0^{g}\cdot575$ of oil gave $0^{g}\cdot283$ of water and 1·332 of carbonic acid;
II. $0^{g}\cdot590$ of oil gave $0^{g}\cdot291$ of water and 1·365 of carbonic acid;
III. $0^{g}\cdot641$ of oil gave $0^{g}\cdot311$ of water and 1·484 of carbonic acid.

Whence is deduced, for its composition in hundredths :—

	I.	II.	III.
Carbon . .	63·17	63·08	63·13
Hydrogen .	5·46	5·47	5·38
Oxygen .	31·37	31·45	31·49
	100·00	100·00	100·00

The formula which best represents the composition of this matter is the following :—

C^{32} . . .	1200·00	63·15
H^{16} . . .	100·00	5·26
O^{6} . . .	600·00	31·59
	1900·00	100·00

This formula might be represented by saliculate of methylen. Indeed, we have :—

$$C^{32} H^{16} O^{6} = C^{28} H^{10} O^{5} + C^{4} H^{6} O.$$

I have therefore endeavored to compare these two bodies, in order to verify the accuracy of my hypothesis; consequently, I prepared saliculate of methylen, and I assured myself of its complete identity with the natural oil of *Gaultheria.* On the other hand, by treating this oil by a solution of potassa, at 45°, to which I had added pieces of that alkali, and submitting the whole to distillation at a moderate heat, I obtained in the receiver a liquid which, treated several times by lime, furnished me a liquid more volatile than water, and burning with a pale blue flame; the residue of the retort, treated by water, gave by the addition of a mineral acid an abundant precipitate of saliculic acid.

By treating the natural oil of *Gaultheria* or the saliculate of methylen, by fuming nitric acid, the temperature was considerably raised; when cooled, it with difficulty disengaged nitrous vapors; very soon all the liquid became a mass of crystals. These crystals, washed with water and purified by several crystallisations in alcohol, affect the form of yellowish white and extremely fine needles.

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* *Comptes Rendus,* No. 16, April 17, 1843.

This compound furnished by analysis the following results:—

I. $0^{g}\cdot836$ of matter gave 0·267 of water, and 1·486 of carbonic acid.

II. $0^{g}\cdot502$ gave $24^{cc\cdot}$ of nitrogen at 11°, and $0^{m}\cdot763$.

Whence is deduced for its composition in hundredths:—

	I.	II.
Carbon . . .	48·42	,,
Hydrogen . . .	5·51	,,
Nitrogen . . .	,,	7·27
Oxygen . . .	,,	,,

The formula which best agrees with these numbers is the following:—

C^{32} . . .	1200·0	48·69
H^{14} . . .	87·5	5·54
N^{2} . . .	177·0	7·18
O^{10} . . .	1000·0	40·59
	2464·5	100·00

A formula which may be decomposed into,

$$\begin{matrix} C^{28}\,H^{8}\,O^{5} \\ N^{2}\,O^{4} \end{matrix},\; C^{4}\,H^{6}\,O,$$

and which makes of this compound anilate or indigotate of methylen.

Bromine and chlorine, on the contrary, appear to react on the portion of the oil which constitutes the methylic base. Thus the bromuretted compound furnishes, by analysis, numbers which lead to the formula $C^{32}\,H^{12}\,Br^{4}\,O^{6}$, which may be regarded as,

$$C^{28}\,H^{10}\,O^{5},\; \begin{matrix} C^{4}\,H^{2}\,O \\ Br^{4} \end{matrix},$$

in which would be found the compound analogous to the chloruretted compound of M. Malaguti. That, however, I shall decide hereafter.

It is evident from the preceding, 1st, That analysis and synthesis agree in confounding the oil of *Gaultheria procumbens* with the saliculic ether of methylen; 2nd, That from this oil may be extracted an acid identical with the saliculic acid obtained from the hydrarguret of salicyle, by M. Piria, and from *coumarine* by M. Delalande; 3rd, Finally, fuming nitric acid converts it into a body belonging to the same series, and in which indigotic acid is found, which hitherto could be obtained only by means of indigo, and which M. Gerhardt formed by the action of nitric acid on saliculic acid.

Without seeking for a moment to account for the manner in which methylic ether takes its rise to enter into this oil, or for the exact form in which it is combined with it, I will call the attention of chemists to a very remarkable circumstance, namely, that wood-spirit, which, hitherto, was met with only in pyrogenous products, is here found in a substance formed under the influence of vegetation.

Although presenting the composition of a neutral ether, the oil of *Gaultheria* acts like a true acid. Thus, treated by caustic potassa and soda, it forms crystallisable compounds soluble in water and alcohol; the addition of an acid regenerates the unaltered oil: it is only from one day to the next that the whole is converted into saliculic acid, which may be obtained by treating the mass dissolved in water with hydrochloric acid. I have ascertained that these strange properties are met with in the oil obtained by distilling saliculic acid with a mixture of wood-spirit, and concentrated sulphuric acid, and that they are found in an analogous compound, the anisate of methylen, an ether likewise formed by an acid containing 5 atoms of oxygen, and to which I have already called the attention of chemists.

The chlorous compound, distilled with cyanuret of mercury, gave chloride of mercury and a white compound which was sublimed, and which probably contained cyanogen in the place of the chlorine.

Iodine dissolved in the oil, but did not appear to cause it to undergo any alteration.

Finally, ammonia acted with this oil in a different way to potassa and soda, and its action appeared to me to give rise to very interesting phenomena.

I propose to publish a Memoir on all these very curious matters, and I have for some time studied them with care, with the view of submitting to the Academy a more extended work; but I have just learned that an American chemist is occupied with this oil, and I thought it my duty to take priority, by at once announcing results the accuracy of which I can guarantee.

ON BEES' WAX.*

BY M. LEWY, OF COPENHAGEN.

Having been for some time occupied with the chemical study of wax, I think I have arrived at a result which appears to me of a nature to interest chemists, although my work announced in the *Annales de Chimie et de Physique* is not yet terminated.

A discussion which has made some noise in the scientific world, has recently been raised, relative to the pre-existence of fatty matters in vegetables.

Liebig, although recognising the existence of fatty matters in the aliments of the herbivora, has remarked that the properties of this fatty body resemble those of wax, and he refuses to admit that *a saponifiable*

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* *Comptes Rendus.*

fatty matter like that of wax can, under the influence of the forces of the organism, be converted into fatty bodies of the nature of those which are deposited in the tissues of animals, such as steäric or margaric acid. The following results, obtained in the laboratory of M. Dumas, demonstrate, I think, that the distance which separates wax from the fat of animal bodies is not so great as the illustrious chemist of Giessen is inclined to believe, according to experiments hitherto known.

The bees' wax which I examined was of perfect purity; its origin was guaranteed to me by M. Boussingault, to whose kindness I owe the samples which I studied.

This wax melted at 147° F.; it furnished, by analysis, the following results:—

	I.	II.	III.
Carbon . . .	79·99	80·48	80·20
Hydrogen . .	13·36	13·36	13·44
Oxygen . .	6·65	6·16	6·36
	100·00	100·00	100·00

These numbers agree well with those recently obtained by Ettling, by correcting his analysis according to the new atomic weight of carbon.

Treated by a concentrated and boiling ley of potassa, this wax was *entirely* converted into soluble soaps.

The saponification, operated by means of oxide of lead, showed that no glycerine was formed during the reaction.

I have proved that, conformably to the opinions of several chemists, bees' wax, purified by boiling water and cold alcohol, contains two immediate principles, of very different solubility in hot alcohol.

One of these principles has received the name of *cerin*; it dissolves in about 16 parts of boiling alcohol: the other, *myricin*, is almost insoluble in boiling alcohol or even boiling ether.

Cerin gave by analysis:—

	I.	II.	III.
Carbon . . .	80·53	80·23	,,
Hydrogen . .	13·61	13·30	13·33
Oxygen . .	5·86	6·47	,,

Its point of fusion is 144·5° F., and it has a very evident acid reaction on litmus paper; dissolved in alcohol, it crystallises by cooling in small and very fine needles.

Myricin furnished the following numbers:—

	I.	II.
Carbon	80·17	80·28
Hydrogen . . .	13·32	13·34
Oxygen . . .	6·51	6·38

Fused at a gentle heat, it begins to solidify at 152° F.

It results therefore from the foregoing analysis, that the two matters which exist ready formed in wax are isomeric with each other and with wax.

By calculating the foregoing numbers according to the formula $C^{68}H^{68}O^{4}$,* we should have:—

C^{68} . .	5100·0	80·31
H^{68} . .	850·0	13·38
O^{4} . .	400·0	6·30
	6350·0	99·99

—a result which agrees very well with the analyses.

I commenced by studying the reactions of cerin.

Treated by potassated lime, heating in an alloy bath, the matter disengages pure hydrogen, and an acid is formed which remains in combination with the alkali; the acid extracted from the soap formed and purified with the precautions employed by M. Dumas in the preparation of ethalic acid, was perfectly white and crystallisable; its point of fusion was 158° F., that is to say, exactly the same as steäric acid.

The analysis of this acid gave the following results:—

	I.	II.	III.
Carbon . .	76·73	77·03	76·71
Hydrogen .	12·86	12·81	12·74
Oxygen . .	10·41	10·16	10·55

These numbers exactly correspond with the formula $C^{68}H^{68}O^{7}$, which gives indeed:—

C^{68} . .	5100·0	76·69
H^{68} . .	850·0	12·78
O^{7} . .	700·0	10·52
	6650·0	99·99

Now such is precisely the formula admitted by Liebig and Redtenbacher for steäric acid.

It appears demonstrated, therefore, that under oxidising influences, wax or cerin may be converted into steäric acid, identical with that which may be extracted from mutton fat.

The following equation accounts for the reaction in a very simple manner. $C^{68}H^{68}O^{4} + H^{3}O^{3} = C^{68}H^{68}O7 + H^{3}$, which is disengaged.

It may therefore be concluded from the foregoing experiments:—

1. That wax, contrary to the received opinion, is soluble in concentrated and boiling potassa:

2. That under oxidising influences, it is converted into steäric acid:

3. That, by an ulterior oxidation, the latter is converted in its turn into margaric acid, as is known:

4. That, consequently, there is between the principles of wax and those of ordinary

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* $C=75$, $H=12·5$.

fatty bodies, no other difference than that which results from a more or less advanced oxidation.

I may add, that by comparing cerin and myricin, and by studying yellow wax and white wax, I observed peculiarities worthy of attention, which will find a place in the Memoir which I am immediately about to publish concerning these matters.

ON XYLOÏDIN.*

BY C. H. D. BUYS BALLOT.

M. **Pelouze** has published some investigations concerning the xyloïdin, which M. Braconnot had obtained by the action of nitric acid on starch and ligneous fibre. M. Pelouze prepared it with starch, by intimately mixing that substance with nitric acid of sp. gr. 1·5 and precipitating immediately by water. Scarcely anything remains in solution in this liquid.

M. Pelouze regards xyloïdin as starch in which 1 equivalent of water is replaced by 1 equivalent of nitric acid, $C^{12} H^{18} O^9 + N^2 O^5$, which explains how the starch increases in weight in its decomposition by nitric acid.

But if xyloïdin be left in contact with nitric acid in a close vessel, without adding water, it is decomposed at the end of two days, sometimes even in a few hours; it completely disappears, and in its place is found a deliquescent acid, which remains after evaporation in the white state, solid and uncrystallisable, and whose weight is much greater than that of the starch employed. Neither carbonic acid nor oxalic acid is formed at the same time.

If, instead of abandoning the mixture of starch and nitric acid to itself, it be heated and evaporated in a sand-bath, according to M. Pelouze, a deliquescent non-nitrogenous acid is obtained, which, although quite different in its composition, presents some resemblance to oxalic acid.

As no analysis of xyloïdin or of the acids to which it gives rise has yet been published, its study not being very far advanced, M. Ballot thought that he ought to make known the observations which he collected concerning this body in the laboratory at Utrecht. From his work he draws the conclusion that the substance which M. Pelouze named xyloïdin is formed of more than one body. Although his analyses differ among themselves, still not one of them is in accordance with the formula of the first chemist, $C^{12} H^{18} O^9 + N^2 O^5$.

Xyloïdin, heated by alcohol, gave him:—

	Found.			Atoms.	Calculated.
Carbon . . .	36·76	37·18	37·29	15	37·31
Hydrogen . .	4·79	5·00	4·99	24	4·84
Nitrogen . .	5·65	5·76	5·17	2	5·76
Oxygen . . .	52·80	52·16	52·55	16	52·09

$$4(C^{15} H^{24} N^2 O^{16}) = 5(C^{12} H^{20} O^{10}) - 2H^2 O + 4N^2 O^4.$$

An analysis of xyloïdin which was treated first by alcohol and then by potassa, gave 37·22 per cent. of carbon and 5·17 per cent. of hydrogen.

To verify the accuracy of this formula and at the same time to ascertain whether any other bodies are produced in the formation of xyloïdin, he carefully sought for a disengagement of gas during the mixture of the starch with fuming nitric acid. None is disengaged then, nor even during the mixture of newly formed xyloïdin with water. The filtered aqueous liquor, evaporated and saturated with ammonia, gave no precipitate by the addition of the salts of lime.

4·612 of starch dried at 100° C. were afterwards converted into xyloïdin by $N^2 O^4$, well washed with water and dried at 212° F. It then weighed 4·800, whence it results that starch really increases in weight in its conversion into xyloïdin.

The author intends to publish his investigations concerning the acid of which M. Pelouze also made mention.

ON THE PROPERTIES OF WAX.*

EXTRACT OF A LETTER FROM M. GERHARDT TO M. DUMAS.

Under the oxygenising influence of nitric acid, wax furnishes exactly the acids which M. Laurent has obtained with the fat oils. I boiled it for a few days with twice its weight of nitric acid, until all the oily substances disappeared; the first crystalline grains which were deposited by cooling, had exactly the properties and composition of *pimelic acid.* The mother liquors furnished a very copious quantity of hemispherical tubercles of *adipic acid;* finally, I also found, in the liquid in which the latter were formed, needles of lipic acid. The last mother liquors did not crystallise, and contained the oily acid known by the name of *azoleïc* or *œnanthylic acid*, distinguishable by its odor of rancid butter, and of which much was volatilised during the ebullition of the mixture.

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* *Annalen der Chemie und Pharmacie.*

* *Comptes Rendus*, No. 17, April 24, 1843.

Boiled for half an hour with nitric acid, wax was completely converted into a solid fat acid, which was entirely saponified by carbonate of soda; I have not yet analysed it, but its physical characters lead me to regard it as identical with margaric acid. Finally, treatment by the same agent, until red vapors are no longer developed, converted wax, as Ronalds has already observed, into succinic acid.

These numerous products are far from being formed all at once; they result from a successive combustion of the oxygen and hydrogen contained in wax. This body, besides, possesses a much more simple composition than M. Lewy has assigned to it.

Wax (or rather cerin,) is *steäric aldehyd*,[*] namely:—

$$C^{19} H^{38} O$$

Steäric acid being $C^{19} H^{38} O^2$

Steärate of potassa $C^{18} (H^{37} P) O^2$.

These formulæ perfectly agree with the analyses of M. Lewy, as well as with those of Chevreul and Erdmann,[†] of steäric acid in a current of hydrogen:—

	WAX.			STEARIC ACID.				
	Calculated.	Found.		Calculated.	Found.			
					Chevreul.	Erdmann.		
Carbon . .	80·8	80·53	80·23	76·5	76·4	76·3	76·7	76·5
Hydrogen . .	13·4	13·61	13·30	12·8	12·4	12·8	12·8	12·8
Oxygen . . .	5·8	5·86	6·47	10·7	11·2	10·9	10·5	10·7

You see, according to these formulæ, that the products of the oxidation of wax are grouped in the following manner, steäric acid being regarded as the first, and succinic acid as the last term of the series:—

MONOBASIC ACIDS.	
Steäric acid . .	$C^{19} H^{38} O^2$
Margaric acid . .	$C^{17} H^{34} O^2$

BIBASIC ACIDS.	
Œnanthylic acid . .	$C^{14} H^{26} O^4$
Pimelic acid . .	$C^7 H^{12} O^4$
Adipic acid . . .	$C^6 H^{10} O^4$
Lipic acid . . .	$C^5 H^6 O^4$
Succinic acid . . .	$C^4 H^6 O^4$

There are evidently some terms wanting, and I am astonished at not having obtained suberic acid by means of wax; but it is very probable that I was not in favorable circumstances for it; suberic acid being itself attacked by nitric acid.

I have some reasons for regarding succinic, suberic, pimelic acids, &c., as bibasic. It is because, under the influence of potassa in fusion, they act quite differently to the monobasic acids which I examined in this respect. The bibasic acids in question are divided into 2, and are converted, with a disengagement of hydrogen, into oxalic acid and *liquid and volatile acids*, among which I have already recognised formic, acetic, and valerianic, or phocenic. I shall soon have occasion to communicate to you the most ample details in this respect. I will add only that the pimelic acid appeared to me to be very well divided into oxalic and valerianic acids:—

$$C^7 H^{12} O^4 + 2H^2 O = C^2 H^2 O^4 + C^5 H^{10} O^2 + 2H^2.$$

Although these reactions are accomplished in a very calm manner, and without the mass being blackened, they present many difficulties in study, on account of the extreme resemblance of the products as to physical characters.

They likewise present great interest, in showing us that it is by simple combustions that the wax contained in the food of our cattle, or in sea plants, may be converted into volatile fatty bodies, like those of butter or of fish oil.

Spermaceti is *ethalic aldehyd*, as wax is that of the steäric series.

ON FERMENTS.[*]

BY M. ROUSSEAU.

1. The essential condition for a ferment to be able to develope alcoholic fermentations, is to be acid to colored papers. This acidity should, moreover, be produced by cer-

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[*] These formulæ express equivalents: according to the old theory, this would be $C^{76} H^{76} O^2$ and $C^{76} H^{76} O^4$.

[†] *Journal für Praktische Chemie*, vol. XXV., p. 497.

[*] *Comptes Rendus*, No. 17, April 24, 1843.

tain vegetable acids, whose special character is such that they may be converted into carbonates or carbonic acid by their spontaneous decomposition. It must especially be observed, in the selection of these acids, that they be those which preëxist in all fermentable fruits, and also even those which are converted into carbonates in the animal economy; such as tartaric, citric, malic, and lactic acids, &c.

2. When the acidity of the ferment is very considerable, the vegetable and mineral poisons, the essential oils, &c. no longer cause the fermentation to undergo any modification, whilst the contrary takes place if the ferment be washed until it becomes neutral. By an opposite effect, fermentation may be rendered considerably more active by the presence of a tartrate, of a citrate, of a malate, or of a lactate. MM. Colin and Thénard have long since noticed the favorable influence which cream of tartar exerts on fermentation.

3. When the ferment, instead of being acid, presents, by a spontaneous alteration, an alkaline reaction on the test paper, put in contact with cane sugar, it no longer developes either alcohol or carbonic acid, but sugar of milk is formed, and afterwards lactic acid: it is thus that caseum, diastase, and animal membranes, give lactic acid when mixed with a solution of sugar, as MM. Boutron-Chalard and Frémy have proved.[*] If all the conditions by the aid of which the phenomenon is accomplished, and the nature of the bodies which are produced, be carefully examined, this action is nothing more than rational; for when the yeast has become alkaline, it is changed in nature, and is converted into a matter which presents all the properties of caseïn.

ACTION OF NITRIC ACID ON THE CARBONATES OF LIME.[†]

BY M. BARESWILL.

It is a fact now admitted by all chemists, that marble is not attacked by nitric acid at its maximum of concentration. I wished to see whether this anomaly was due to an action similar to that which the same acid exerts on certain metals. I kept a piece of marble in nitric acid of the maximum degree of concentration, and I ascertained that it was not perceptibly attacked. I withdrew it from the acid, washed, dried, and pulverised it, and introduced the powder into fresh acid; it was violently attacked, but not completely dissolved. I then added a little water to the acid; the reaction was again manifested, then ceased after some time, and recommenced on the addition of a fresh quantity of water. From these facts it may be concluded, that marble is acted on by concentrated nitric acid, with an energy proportional to its surface, only it becomes covered with a *varnish* of nitrate of lime insoluble in concentrated nitric acid. This nitrate of lime concentrates the nitric acid in which it is produced, and brings it to the maximum of concentration. The direct experiment was perfectly conclusive. Dried nitrate of lime, put in contact with nitric acid of medium strength, concentrated it to such a degree as to render it fuming.

ANALYSIS OF THE SCOTT SPRING, SCOTT COUNTY, VIRGINIA.

BY C. B. HAYDEN, OF ABINGDON, VA.

The temperature of this spring (68½°), fifteen or sixteen degrees higher than the average temperature of the springs of the vicinity, classes it among the *thermal* waters, and renders it a natural medicated warm bath, subserving all the purposes of health and luxury, without being sufficiently high to impart to it the usual disagreeable flavor of warm waters.

One wine gallon contains 41·14 grs. of saline matter, consisting of

Chloride of sodium Chloride of aluminum	1·51 grs.
Sulphate of soda	a trace.
Sulphate of magnesia	12·75 grs.
Phosphate and sulphate of alumina	a trace.
Carbonate of lime	6·42 grs.
Sulphate of lime	20·46 grs.

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[*] *See* The Chemist, Vol. II., p. 198.

[†] *Journal de Pharmacie et de Chimie*, April, 1843.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

FRAUDS ON THE EXCISE.—ADULTERATION OF TOBACCO.

We have again to call the attention of the Excise to the great extent to which the revenue is defrauded with respect to this article. Tobacco is now offered for sale at 3*d.* per ounce, *i. e.* 4*s.* per pound, while the duty alone amounts to about 3*s.* 3*d.*, thus leaving 9*d.* to be divided among the grower, the importer, the manufacturer, and the retailer. Is it possible for this tobacco to be genuine? It cannot be.

It is true that the venders of this cheap tobacco, inform those who question them on the subject, that "it is of a coarser quality;" such, in fact, has been the reply given to ourselves in *many* instances; but those who are acquainted with the subject, well know that the only means of selling tobacco at that price, consists in adulterating it, and that to such an extent as to cause considerable injury to the revenue.

We have been informed that an order has been issued from the Board of Excise, to the Excise officers, directing them to take samples of all tobacco which they have any reason to suspect; but we very much fear that this will not tend to diminish the evil, as the officers, not being analytical chemists, and being unacquainted with the botanical characters of the tobacco leaf, cannot determine whether it is adulterated or genuine.

This can be done with accuracy only by a chemist who has had experience in the analysis of tobacco.

We intend to purchase samples of this cheap tobacco wherever we see it ticketed up, and we have no doubt that we shall thus be enabled to assist in putting a stop to a system of fraud disgraceful to those who practise it, highly injurious to the revenue, and prejudicial to public health.

It has long been our conviction, that if the numerous frauds on the revenue were more completely guarded against by the Government, the present grievous deficiency in the public income would be greatly diminished. So far as our humble aid can be of service, we shall at all times be most willing to render it, in exposing such adulterations of excisable articles (among others) as we may discover, and we shall make it our duty to seek after such adulterations.

In furtherance of the objects which we have in view, we shall feel obliged by any information which our readers may have it in their power to communicate to us, and of which we shall make proper and efficient use.

ON THE PRODUCTION OF THE PRECIOUS METALS IN MEXICO, CONSIDERED IN ITS RELATIONS TO GEOLOGY, METALLURGY AND POLITICAL ECONOMY.*

BY M. SAINT-CLAIR-DUPORT.

In his *Political Essay on New Spain*, Baron Humboldt made known the state of the mines in Mexico, their produce in gold and silver, the average richness of the ores, the annual consumption of mercury in amalgamation, and finally, the quantity of precious metals exported from New Spain, from the Conquest until 1803, the period of his return to Europe.

The War of Independence, the political changes which occurred in the country, and other causes resulting from them, having brought about great modifications in the productions of the mines in general, it became important to take up the subject where Humboldt left it. This has recently been done by M. Duport, in a very extended work, which he has just presented to the Academy, and which was sent for examination to a commission, composed of MM. Berthier, Dumas, Elie de Beaumont, Boussingault and Becquerel.

M. Duport having resided in Mexico almost uninterruptedly for sixteen years, has been, on account of his connections with the principal mining companies, and on account of the influence which he acquired in his industrial operations in the refining of the Mexican Mint, in the most favorable position, not only for studying, but also for introducing perfections into, the metallurgy of silver.

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* Translation of the Report of a Committee of the Royal Academy of Sciences, consisting of MM. Berthier, Dumas, Elie de Beaumont, Boussingault and Becquerel. From the *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, No. 17, April 24, 1843.

To attain this object, he visited, at different times, the principal metalliferous beds (*gîtes*), from Tasco to Guadalupe y Calvo, in the States of Sonora and Chihuahua, passing over a space of more than 6000 kilometres. The observations which he collected relative to geology, mineralogy, and the metallurgical arts, are given in the work of which we are about to give an account, following the order which he himself has adopted.

Hitherto we have had no documents relative to the geognosy of Mexico, except some information of Sonneschmidt, published towards the end of the last century; the works of Baron Humboldt, and the more recent ones of Burckhardt. M. Duport has particularly applied himself, in the geological description of Mexico, which he has given us, to the metalliferous islands, which, according to him, are difficult to distinguish, either according to their age, or according to their mineralogical nature. He has also entered into some details concerning the general geology of the country, with which we do not here occupy ourselves, inasmuch as we apply ourselves particularly to the metallurgical part; however, we may mention that the principal rocks in which the argentiferous veins are found, are the argillaceous and talcy schists, diorite, the calcareous rock which seems to resemble the Jurassic formation, and sometimes porphyries: the volcanic rocks, with the exception of those of Bolaños, very rarely contain silver.

Mexico is divided, with relation to its temperature, into three different climates: the cold country (*Tierra Fria*), the temperate country (*Tierra Templada*), and the hot country (*Tierra Caliente*), where the vegetation is most active; it is in the second, that almost all the metalliferous beds are met with, which M. Duport has divided into four principal classes:—

1. Beds occurring in rocks forming the same chain of mountains, such as Real del Monte and Pachuca:
2. Veins existing in different rocks from those of the principal chain, as Guanaxato and Tasco:
3. Veins situated in an isolated acclivity, as Zacatecas and Catorce:
4. Veins occurring in plains, such as Ramos, the Fresnillo, and Plateros.

Almost all the veins run between the south and the west; those which furnished the greatest riches approach nearer the line passing by the north-west and south-east. Their inclination is rather towards the north than toward the south, and the angle which it forms with the horizon is seldom below 45°. The principal metalliferous beds are true veins, and in general the metalliferous layers are not very abundant.

The extent of the veins varies from a few decimetres to 40 metres, as at Guanaxato; but it is remarkable that the *salbandes* are frequently impregnated with silver, as well as the rock in which they are incased, at the distance of one or two metres.

As regards the quality of the vein in proportion as the distance from the crest is increased, M. Duport has ascertained that there is no certainty in this respect; however, the greatest richness in silver is found, in general, from 100 to 400 metres deep. Nevertheless, as an exception, the exploitations of Sonora and of Chihuahua, are deepest towards the crest; however, a certain limit, beyond which the depth diminishes, must not be exceeded. This circumstance, joined to the increase of the expenses of extraction, is the cause of the cessation of the works of the deepest of the mines of Mexico, the Valenciana, which has produced such great riches, and whose depth is about 650 metres.

M. Duport considers the veins as presenting two zones, divided on setting out from the soils. The first is comprised of ores called *Colorados*, on account of the color which is communicated to them by the presence of the hydrated peroxide of iron, and which are formed of greyish quartz, whose cavities are filled with metallic oxides. The second contains ores which have received the name of *Negroes*, on account of the dark color given to them by the sulphurets of lead and zinc. In both zones, according to M. Duport's opinion, the metals were originally in the state of sulphurets, but in the region of the colorados, the atmospheric agency has given rise to chemical actions which have produced new combinations. It is to be remarked that this zone of the colorados is so much the less deep, as the vein is of a more resisting nature. When quartz predominates, and when the metallic sulphurets are not very abundant, the decomposition occurs only for a few metres in depth; but when the gangue contains lime, and when pyrites and other substances abound, the decomposition sometimes extends to several hundred metres. The composition of the silver ores of Mexico has been well known only since M. Duport put European chemists in a situation to analyse samples taken from a certain number of quintals, which he brought with him two years ago, and which came from the principal beds of Mexico, such as Guanaxato, Zacatecas, Pachuca, Fresnillo, &c., with the view of devoting himself to the experiments, of which we shall expressly speak.

These ores differ little in nature from one another; they are in general composed of compact quartz, spotted or veined with metallic matters. The iron pyrites, which always predominates, is frequently accompanied with blende, mispicket and galena; and, besides, in the state of extreme dissemination, with metallic silver, sulphuret of silver and red silver; rarely with chloride or bromide of silver, the existence of which was ascertained by one of the chemists charged with the examination of these ores.

The analyses of these ores cannot fail to interest those connected with mines; for besides the advantages arising from a knowledge of their exact composition, they will know that by mechanical preparations, by employing a methodical washing, or an analogous process, they may obtain, especially from that of Guanaxato, schlichs, containing almost all the metallic substances. When this concentration of the silver ore is effected, an immense progress in the metallurgy of silver will have been made.

The metalliferous beds, which particularly occupied the attention of M. Duport, and to which his observations relate, are those of Guanaxato, Zacatecas, Fresnillo, Sombrerete, Catorce, Guadalupe y Calvo, Tasco, Ramos, Angeles, the Blanca ojo and Caliente. He explains, in detail, everything concerning the subterraneous works of the mines, the extraction, picking, and transport of the ore, &c. &c.

With relation to the motive force necessary, either for the removal of the water, or for the extraction of the ore and its mechanical trituration, he shows that steam can be employed in only very few localities, on account of the almost total want of fuel. Fresnillo, Bolaños, and Real del Monte, are the only exploitations where this agent has been usefully employed; without it, the first of these mines, which, in 1841 and 1842, furnished $\frac{1}{8}$ of all the silver produced in Mexico, would have ceased to be worked. Now, his manufactory treats 100,000 kilog. of ore per 24 hours. The recollection of immense profits formerly made by the working of silver mines in Mexico, now induces speculators to form new establishments as soon as the extremities of veins which present only slight indications of richness are discovered; but if the adventurers, were better informed than they frequently are, and took an exact account, by consulting correct statistical works, of the expenses of extraction and treatment, and of the probable advantages which may result from them; if they possessed generally more extended geological knowledge than prevails in the country; then, guided by more certain data, they might devote themselves to enterprises which, often ill understood, cause the ruin of companies, and discourage capitalists, at first seduced by the allurement of gain. In this respect, the work under consideration cannot fail to be useful to them.

M. Duport has treated of the production of gold and silver before the Conquest, without entering, however, into such extended details as Humboldt. According to him, the ancient Mexicans confined themselves to collecting the precious metals by washing,—so far as can be judged from the proportion of gold relative to silver in the spoils taken by Cortez. It was actually found, in the first part of the letter from Cortez to Charles V., that this proportion was as 21 to 5, and very different from what it is now. As soon as the Spaniards were masters of the country, they commenced treating the ores by fluxing; but the products were at first very limited, on account of the scarcity of fuel, and its absolute absence in certain localities, and of the deficiency of waterfalls.

This state of things changed at the period of the discovery of amalgamation by *patio*, which requires fuel only to the extent of 1 per cent. of the value of the silver, thus allowing silver to be extracted from ores containing too small a portion to be treated by fusion, even in the European mines.

Three modes of treatment are now in use in Mexico: fluxing, cold amalgamation (*patio*), and amalgamation by heat (*cazo*). Cold amalgamation is more prevalent than the other two: without the employment of this method, the products would be very trifling.

The treatment by fluxing is very expensive, on account of the scarcity of fuel, and waterfalls, and because it has not received the perfections resulting from improvements in the construction of furnaces, and from the rational employment of fluxes; it is commonly employed only for rich ores. The fluxes are litharge and the carbonate of soda (*tequez quite*), which is found in very large quantity in some localities near the exploitations.

Cold amalgamation (*patio*) particularly attracted the attention of M. Duport, who has endeavoured to omit nothing calculated to elucidate this mode of treatment. Thus he gives the price of the ingredients,—sea-salt, magistral or sulphate of copper, and mercury,—and makes known the localities where each of the manufactories procures the salt which it requires. The price of the salt of colima, at Guanaxato or Zacatecas is about 12 piastres the three Spanish quintals, or about 45 francs the 100 kilogrammes.

The saltierra, which, according to a recent analysis, contains only $\frac{1}{5}$ of chloride of sodium, ordinarily costs at Zacatecas $4\frac{3}{8}$ piastres the 200 pounds of salt, which, in salt of colima, would cost 8 piastres.

M. Duport makes known the mode of manufacture of magistral in various mining districts, such as Zacatecas, Guanaxato, and others of less importance.

The magistral employed at Guanaxato, contains $\frac{1}{5}$ of anhydrous sulphate of copper; it is formed with copper pyrites, properly roasted. The formation into the sulphate is performed with so much care, that the magistral contains only 4 per cent. of free oxide of copper. Nothing has been omitted which could enlighten the exploitation, concerning the means of ascertaining its good quality, its price in different localities, &c. &c.

As soon as the process of amalgamation was discovered, the government seized the monopoly of mercury.

The tables which M. Duport has given in his work, show the influence which the successive abatement of its price, agreed to by the court of Madrid, exercised over the production of silver in Mexico. In 1766, it cost 42 piastres 36 reals the quintal,—a price which was maintained until the independence of Mexico. Commerce having become free, the price of mercury varied from 50 to 70 piastres. This state of things lasted until a powerful capitalist, having become the highest bidder for the products of the mine of Almaden, raised the price to 130, and even to 150 piastres, according as the mines were more or less distant from the sea. This exorbitant increase of price contributed in no slight degree to paralyse or at least to retard the metallurgy of silver.

M. Duport afterwards gives the history of Mexican amalgamation, commencing by describing the mechanical preparations, and making known the different phases of the operation, as well as the theories which have been successively given of this ingenious process. He shows us Sonneschmidt considering the action of sea-salt and magistral as confined to the electro-negative elements which these compounds contain; Karsten announcing the faculty possessed by a saturated solution of sea-salt of dissolving chloride of silver, and the influence of bichloride of copper,—and one of your Committee first explaining the manner in which the chloruration of the sulphuret of silver is operated by bichloride of copper. All these successive discoveries now served as bases for the theory of amalgamation, but a host of facts of detail still remained to be made known, for which we should be indebted to M. Duport. We shall give, as succinctly as possible, the principal phenomena of amalgamation as he has described them.

(*To be concluded in our next.*)

INVESTIGATIONS CONCERNING THE COMPOSITION OF THE GASES WHICH ARE DISENGAGED FROM THE REFINING FURNACES; THE CARBONISATION OF WOOD, AND THE PRODUCTION AND EMPLOYMENT OF COMBUSTIBLE GASES IN THE METALLURGICAL ARTS.*

BY M. EBELMEN.

(EXTRACT.)

In the work which I have the honor of laying before the Academy, I have endeavored to elucidate the theory of some large metallurgical operations by studying the composition of the gaseous products at different stages of the work, and in different parts of the apparatus. Atmospheric air being an indispensable agent in all these operations, the examination of the gases makes us acquainted with the series of transformations which it undergoes, and the application of which is intimately connected with the examination of the calorific effects and chemical reactions which are produced in the furnace. Indeed, the oxygen of the air, in being converted into carbonic acid, developes a very high temperature, which is speedily lowered by the passage of the carbonic acid to the state of oxide of carbon. Before this latter transformation, the gas is oxidising; after it is operated, it possesses energetic reductive properties.

The first investigations on this subject, which I submit to the Academy, relate to the examination of the gas of high furnaces. The vast dimensions of these metallurgical apparatus enabled me to determine in a very clear manner the variations in the composition of the gaseous column which traverses the high furnace, and to deduce from these variations the nature of the corresponding chemical reactions. I have studied in the same point of view another operation carried on in France, on a large scale—the conversion of cast iron into iron in a refining furnace fed with wood charcoal.

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* *Comptes Rendus*, No. 15, April 10, 1843.

In these furnaces, the air is passed by one or two tubes into a crucible filled with charcoal, in which is placed, in a constant relative position, the cast iron to be refined and the iron to be forged, which arises from a preceding operation. The oxygen of the projected air is changed, first into carbonic acid, then into oxide of carbon. The analysis of the gases aspired in the funnel of the furnace proves that the conversion of the oxygen into carbonic acid corresponds to the constant position in which the workman places the iron which has to be forged, and which is the locality of the maximum of temperature.

The atmosphere which surrounds the cast iron during its fusion contains little or no carbonic acid, and it can have no decarbonising power, contrary to the generally admitted opinion, according to Karsten, who attributes to the action of the air the decarbonisation which takes place during the fusion of cast iron. It is to the protoxide of iron of the scoriæ alone that this action should be attributed. Dulong's experiments, concerning the heats of combustion, prove that this decarbonisation should produce a considerable absorption of latent heat.

In the second period of the refining, or the work properly so called, it was easy for me to deduce from the analysis of the gases that there was an oxidation of a considerable proportion of iron by the oxygen of the projected air.

The sensible heat and the heat of combustion of the gases of the refining fires being turned to a number of uses, I determined their average composition at different stages of the work, and I was thus able to prove that this heat could not probably be applied to purposes which require a high and sustained temperature.

In the second of the Memoirs, which I now present to the Academy, I have examined what passes in another large operation of the arts—the carbonisation of wood. All the methods according to which it is executed may be divided into two classes. In the first class, the distillation is operated in close vessels, and the results are quite comparable to those obtained in the numerous experiments in the laboratory. In the second class are ranked all the processes of carbonisation by incomplete combustion, in which one portion of the combustible is sacrificed in order to distil the other. Almost all the wood charcoal is prepared in France by a process belonging to this class, and which is known by the name of "process of carbonisation in stacks." The wood is heaped up in conical piles of variable size, which are covered with a thick layer of earth and cinders. The stack is lighted by fitting to the centre a chimney which descends to its base, and in which ignited charcoal is placed, of small wood, and the air is allowed to penetrate by vents made at the base, and all round the stack. After some hours, during which the chimney remains open in order to admit of a more rapid combustion, the upper orifice is closed, and the carbonisation is directed from above to below, penetrating through the covering of the holes whose plane approaches more to the base of the stack, in proportion as the operation advances.

The theory of this important operation presented many undecided points. It was not known whether the oxygen of the air introduced by the vents of admission, passed to the state of carbonic acid or to the state of oxide of carbon; or whether the combustion took place on the charcoal already formed, or on the products of the distillation of wood.

Such are principally the questions which I desired to solve. By examining the composition of the gaseous products of the vents of disengagement, and comparing it with that of the gases obtained in the carbonisation in close vessels, I arrived at the following conclusions, which agree very well with my experiments, and which appear to me fundamental for the theory of the operation:—

1. The oxygen of the air introduced by the vents of admission is completely converted into carbonic acid, without any mixture of oxide of carbon:

2. This oxygen is carried entirely on to the charcoal already made, and it has no action on the products of the distillation.

The comparison of the results of the carbonisation in stacks with those which are obtained by cold air in a furnace, fed with wood in the natural state, led me to a direct verification of the fact which I had deduced from Dulong's experiments, namely, an absorption of latent heat, by the conversion of carbonic acid into oxide of carbon. The wood is carbonised in a certain zone of the furnace, and I have proved that the oxygen of the air is completely changed into oxide of carbon before passing into the region where the distillation takes place. The proper temperature of the gases and of the products of distillation which leave the furnace is very little above 212 F., and this conclusion may be deduced from it;—that the distillation of wood absorbs a quantity of latent heat, nearly equal to the heat developed by the conversion of the remaining carbon into oxide of carbon.

In the furnace, the distillation of one

part of volatile substances corresponds to 0·213 of carbon changed into oxide. In the stacks of carbonisation, one part of volatile substances is distilled, consuming 0·0535 of carbon, changed into carbonic acid.

This result clearly proves that there is an absorption of heat, and an abatement of temperature, in the conversion of carbonic acid into oxide of carbon.

The results obtained by burning wood in the natural state in a furnace, give a very satisfactory explanation of the circumstances observed in the rolling of the high furnaces, in which the employment of this combustible in the crude state has been attempted.

The third Memoir, entitled, *Investigations concerning the Production and Employment of Combustible Gases in the Metallurgical Arts*, contains the results of a certain number of experiments performed in the manufactory of Audincourt (Doubes), at the expense of the state, by virtue of a mission confided to me by the Under Secretary of State for the Department of Public Works. I endeavored to ascertain whether it would not be more advantageous, in many cases, to convert the solid combustible into gas, in order afterwards to burn the latter by means analogous to those already employed for the gases of high furnaces.

The experiments already made especially relate to combustibles of vegetable origin, wood charcoal, wood and turf. I will here content myself with summing up the principal consequences which may be deduced from them.

1. Small charcoal, cinders (*braises*), and the waste of the market, may be turned to account for producing gases which are essentially formed of a mixture of oxide of carbon and nitrogen, and which can develope, in a reverberatory furnace, the highest temperatures required in the working of iron.

This conclusion has been deduced, not only from the analysis of the gases, but also from experiments made on a large scale in a furnace for welding iron, which was kept up during the whole time occupied by the experiments with great regularity. A gas generator, similar to that which I had constructed for these experiments, is now regularly used in the manufactory of Audincourt, for heating an iron plate furnace.

2. By employing, to maintain combustion in the gas generator, a mixture of air and steam, results were obtained which agree very well with those deduced from Dulong's experiments, and prove that the decomposition of steam is operated in contact with incandescent charcoal, determining a great absorption of latent heat. The quantity of steam which can be introduced with the air into the generator is on this account necessarily limited; it depends on the temperature of the air, and of the steam. By employing a slight excess of the latter, it is found that one portion passes through the charcoal without decomposition, whilst the other uniformly gives a mixture of hydrogen and carbonic acid.

3. The composition of the gases produced with air and wood in the natural state appears to me to remove all doubt concerning the advantage which the combustion of the wood gases, after the condensation of the liquid products of the distillation, would possess over direct combustion. The former considerably diminishes the temperature of the combustion, and consequently causes a much greater consumption of combustible; besides, accessory products will be obtained, such as tar and acetic acid, the importance of which should be taken into consideration.

By burning wood in a special furnace, which I call an inverted combustion generator, it is easily changed into a gas containing about 37 per cent. of hydrogen and oxide of carbon, and in which the products which constitute the smoke completely disappear. This apparatus is constructed in such a manner as to force the products of the distillation to pass under the wind of the tube, and to traverse a very long column of incandescent charcoal; it may be turned to account, I think, in many operations of the arts.

4. The composition of the gases produced by turf, in a direct combustion generator, differs from wood gases, as turf charcoal does not convert the oxygen of the air into oxide of carbon so rapidly as wood charcoal; in this respect, great differences exist among the different kinds of charcoal. In my Memoir, I show to what those differences are owing which are observed in the calorific effects produced by various combustibles, particularly by coke and wood charcoal, when they are employed either in large metallurgical furnaces, or in laboratory furnaces. The explanation to which I have been led is completely different from that hitherto admitted; it is based on the fact, that some combustibles do not convert carbonic acid into oxide of carbon so rapidly as others: the higher the zone in which this transformation is operated, the more diffuse is the locality of the maximum of temperature.

The following is a summary of what appear to me the principal advantages presented by the transformation of combustibles into gas:—

1. In the apparatus which I have de-

scribed, combustibles highly charged with earthy matters may be turned to account, and gases may be obtained from them, whose composition and calorific power are nearly independent of the proportion of ashes.

2. Slowly burning combustibles, such as wood and turf, may be converted into gas, whose combustion, after the condensation of the liquid products of distillation, will develope a much higher temperature than is produced by direct combustion.

3. Finally, the employment of gases allows of heating the combustible and the air necessary to combustion, by the waste heat of the furnaces, thus obtaining much higher temperatures than with a combustible and cold air, and therefore admits of a much more considerable proportion of the heat produced being turned to account in metallurgical apparatus.

I purpose to extend the investigations, the first results of which I submit to the Academy, to various mineral combustibles, particularly to those charged with earthy matters, and to the anthracites.

ON THE APPLICATION OF THE GAS OF HIGH FURNACES TO METALLURGICAL TREATMENTS.*

BY MM. LAURENS AND THOMAS.

Attention has lately been drawn to the substitution of gases for natural combustibles in manufacturing furnaces. This important question having been submitted to the Academy in a recent Memoir by M. Ebelmen,† a mining engineer, on the formation and composition of the gases which metallurgy is called upon to employ, we thought that the Academy would take some interest in the communication of a few facts relative to the use of gases on a large scale. The generalisation of the employment of combustible gases instead of combustibles, might give rise to the serious fear of exposing workmen to new dangers; these gases, are inflammable, and they contain very large proportions of oxide of carbon. Thus, to the possibility of explosions may be added, perhaps, the more serious one of asphyxia. The works of M. Leblanc have shown how deleterious is an atmosphere containing even a small quantity of oxide of carbon, and how dangerous it is to remain in it. We hasten to say, that if the application of gases in a great number of manufactories has already occasioned accidents, none of them have ever been fatal. Judicious arrangements will prevent all bad consequences. A useful preservative against asphyxia consists in the odor which the gases always possess, which prevents people from being exposed to it unawares. We have very often seen (we might quote 30 cases) workmen, after having imprudently respired gases containing from 15 to 20 per cent. of oxide of carbon, fall in a swoon; but the most simple treatment employed in such circumstances restores sensation, and, after a few hours' rest, they are able to resume work. On going into an atmosphere vitiated by a mixture of oxide of carbon, carbonic acid, and nitrogen, such as the gases of high furnaces, a very slight headache is perceived, speedily followed by vertigo, and if we do not hasten out of this atmosphere, we fall senseless without being able to utter a word; no suffering accompanies this swoon.

Explosions are produced in furnaces principally at the time of lighting them, and in the conduits a few moments after the extinction of the gas furnaces. By means of suitable precautions in these two operations, explosions may with certainty be avoided. If these precautions are neglected by the workmen, the injurious effect of the detonation of the gas may be lessened by the action of numerous safety valves, which it is necessary to adapt to the furnaces and to the gas conduits.

The nature of the gases has great influence on the intensity of the explosion: thus a mixture of oxide of carbon, carbonic acid, and nitrogen, the first of these gases being in the proportion of from 15 to 25 per cent., never gives a violent explosion; but the addition of hydrogen, even in the small proportion of 2 or 3 per cent., is sufficient to greatly increase the energy of the detonations. The heating of gases in red hot tubes, before their admission into the furnaces of combustion,—an operation often necessary for obtaining high temperatures in a constant manner,—requires some peculiar precautions, by aid of which explosions are no longer either frequent or dangerous.

In the production of gases, the formation of carbonic acid should, as much as possible, be avoided. We have remarked that the proportion of this gas was so much the smaller, as the pressure under which the air was injected into the gas generator was higher. If the air be not introduced with pressure, and if it be obtained by the draught of a chimney, a considerable quantity of carbonic acid is, on the contrary, produced, although the layer of the combustible be thick; by increasing the energy of the draught, by a mechanical action, the greater part of the carbon passes to the state of carbonic acid.

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* *Comptes Rendus*, No. 17, April 24, 1843.

† See the preceding paper.

Instead of injecting the air by pressure with a blowing machine, it may be sufficient to obtain its insufflation by means of the same steam destined for producing hydrogen in the gas. It will always be useful to overheat this steam, that is to say, to raise it, after its formation, to a higher temperature than that which corresponds to its pressure. This heating of the steam, which is called upon to perform an important part in the production of the gases, does not occasion, as might be feared, the rapid destruction of the iron or cast-iron tubes in which it is effected. Although the steam be raised to 660° F., it is not decomposed by the metal of the tubes, or at any rate only in very small proportions, so long as its current is continued, and its heating regular.

An interesting result, which is obtained with highly heated steam, is that by causing it to act alone, at a temperature scarcely amounting to 572° F., pit-coal, wood, and turf may be completely carbonised; combustible gases are disengaged, which are applicable to various uses, after being passed into a condenser. The residuary charcoal is considerable, and is very hard even when it is obtained from turf.

The communication of these facts will put the Academy in a situation to ascertain that the employment of gases in industry has been the subject of studies and labors of long duration.

ON A NEW PROCESS OF POLISHING THE PLATES DESTINED TO RECEIVE PHOTOGRAPHIC IMAGES, PERMITTING IDENTICAL RESULTS TO BE OBTAINED SO LONG AS THE EXTERNAL CIRCUMSTANCES REMAIN THE SAME.*

LETTER FROM M. DAGUERRE TO M. ARAGO.

Since the publication of my process, I have not been able to occupy myself much with it. The investigations to which I devoted myself have been in an entirely new direction, and the experiments which they required were analogous with the preceding ones, only inasmuch as they were made on a metallic plate. However, I have lately been so much struck with the unequal results which the impressions generally present —even those of persons who are especially occupied with them—that I determined to seek some means of remedying this serious inconvenience, which I attribute to two principal causes.

The first relates to the operation of polishing, which it is physically impossible to effect without leaving on the surface of the plate traces of the liquid and of the other substances used in this operation; the cotton alone which is employed, however clean it may be, is sufficient to leave a film of dirt on the silver. This first cause constitutes a very great obstacle to the success of the impression, because it retards the photogenic action, by preventing the iodine from coming in direct contact with the silver.

The second consists in the alterations of the temperature of the air with which the plate is in contact, from the first operations to the mercurial operations. It is known, that when a cold body is surrounded with warmer air, it condenses its moisture. To this effect must be attributed the difficulty which is experienced in operating in a humid medium, especially when we come to the mercurial operation, which requires, to raise a suitable vapor, a temperature of at least 122° F.

This vapor, which first heats the air contained in the apparatus, produces on the metal a dew which weakens the image. It is very evident that this humid layer is very injurious; since if, for example, the plate on leaving the camera obscura be breathed on two or three times, the mercurial vapor can no longer cause the impression to appear.

The water which is condensed, *even at the slightest difference of temperature* between the surface of a body and the surrounding air, contains in solution, or in suspension, a non-volatile substance, which might be called atmospheric dust; and as soon as the equilibrium of temperature is established between the air and the surface of the body, the humid vapor which was condensed on it is volatilised, and depositing on it the dust which it contains, goes on to be re-saturated in the air with a fresh quantity of this impure substance.

In order as much as possible to neutralise this effect, the temperature of the plate may be kept higher than that of the surrounding air, during each of the operations. But it is impossible to cause this heat to reach to 122° F., in order for it to be of the same temperature as the vapor of mercury, since if the plate be exposed to that degree of heat after the operation of light in the camera obscura, the image will be altered.

I first tried to absorb the humidity of the air in the mercurial box by the usual means, such as lime, &c.; but these means are insufficient, and only complicate the process, without giving a good result. Another means which has been proposed, consists in vaporising the mercury under the pneumatic machine; by this process, truly, the dew on the plate is avoided, but the pressure of the air, which is indispensable to the impression, is suppressed. The results thus obtained, also, are always wanting in purity.

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* *Comptes Rendus*, No. 11, March 13, 1843.

The following is the process at which I have stopped, because it is very simple, and because it obviates the two inconveniences above-mentioned; that is to say, it frees the silver as much as possible from all dirt or dust, and neutralises the humidity produced by the elevation of temperature in the mercurial box. By the first of these two effects, it increases the promptitude; and by the second, it renders the lights much whiter (especially by the application of M. Fizeau's chloride of gold): these two effects are always certain. The promptitude given by this process is to that hitherto obtained as 3 to 8; this proportion is accurate.

This process consists in covering the plate, after having polished it, with a layer of very pure water, and heating it very strongly with a spirit-lamp, and in afterwards pouring off this layer of water in such a manner that its upper part, where the dust which it has raised floats, does not touch the plate.

MODE OF OPERATING.

It is necessary to have a frame of iron wire of the size of the plate, having at one of its angles a handle, and in the middle, on the two opposite sides, two small cramp-irons, to retain the plate when it is inclined. After having placed this frame on a horizontal plane, the plate is placed on it, which is covered with a layer of very pure water, and putting as much water as the surface can retain. The bottom of the plate is afterwards very strongly heated, and very small bubbles are formed at the surface. By degrees these bubbles become larger, and finally disappear; the heat must be continued to ebullition, and then the water must be poured off. The operator should commence by placing the lamp under the angle of the frame where the handle is; but, before removing the frame, this angle must be very powerfully heated, and then, by gradually removing it by means of the handle, the water immediately begins to run off. It must be done in such a way that the lamp shall follow, under the plate, the sheet of water in its progress, and it must be only gradually inclined, and just sufficient for the layer of water, in retiring, not to lose in thickness; for if the water were dried up, there would remain small isolated drops which, not being able to flow off, would leave on the silver the dust which they contain. After that, the plate must not be rubbed; very pure water does not destroy its polish.

This operation should be performed only just before iodising the plate. Whilst it is yet warm, it is placed in the iodising box, and, without allowing it to cool, it is submitted to the vapor of the accelerating substances. Plates thus prepared may be kept one or two days (although the sensibility diminishes a little), provided that several plates be placed opposite to one another, at a very short distance apart, and carefully enveloped to prevent change of air between the plates.

OBSERVATIONS ON THE POLISHING OF PLATES.

The plates cannot be too well polished. It is one of the most important points to obtain a fine polish; but the purity often disappears when substances which adhere to the surface of the silver are used; such as the peroxide of iron, which has been very generally made use of for giving the last polish. This substance, indeed, seems to burnish the silver, and to give it a more perfect polish; but this polish is factitious, since it does not really exist on the silver, but in fact on a very fine layer of oxide of iron. It is for this reason that there is required for polishing them, a substance which does not adhere to the silver; pumice, which I recommended at the commencement, leaves less residue.

As regards the liquid to be employed: in the first operations, nitric acid of five degrees must be employed, as I stated in the first instance; but for the last operations, it must be reduced to one degree.

The polishing with oil and the heating may be suppressed.

I take the opportunity afforded by this communication to lay before the Academy the following observations which I owe to experience:—

The layer produced by the descending vapors of the iodine and of the accelerating substances, forms with silver a more sensible compound than is obtained with the ascending vapors. I make this observation only to lay down a fact, for it would be difficult to employ descending vapors, on account of the dust which might fall during the operation, and from stains.

The resistance which light experiences in passing through ia white glazing (*vitrage*) is well known. This resistance s even greater than it appears, and may be attributed not only to the dust which is left on the glazing in cleaning it, but also to that which is naturally deposited on it. The object glass of the camera obscura is certainly in the same case. To ascertain this, I put the object glass in cold water, which I boiled; I knew that it was impossible to remove it without the layer of dust which floats on the surface of the water being deposited on the two sides. This operation had, therefore, no other object than to raise the temperature of the glass to 212° F. C., and I then immediately poured on the two sides of the object glass very pure boiling water to remove the dust. By operating directly with the object glass, thus cleansed, I still further increased the promptitude. This means presents too many difficulties to be put in practice; only care should be taken to clean the object glass every day.

The atmospheric dust, which is the scourge of the photogenic images, is, on the contrary, favorable to images which are obtained by contact or at a very short distance. To be convinced of this, we have only to clean the two bodies which we wish to put in contact with the boiling water, as I have just indicated, and to keep them both at the same temperature as the air; there will then be no impression, which evidently proves that these images have no relation with the radiation which gives photographic images.

Moreover, I have long remarked the difference which exists between these images, since I noticed it in the note which I added to Niépce's process at page 44 of my pamphlet, published in 1839.

OBSERVATIONS ON THE MEMOIR OF MM. DUMAS, BOUSSINGAULT, AND PAYEN, ENTITLED, "INVESTIGATIONS CONCERNING THE FATTENING OF CATTLE, AND THE FORMATION OF MILK."*

LETTER FROM PROFESSOR LIEBIG:

WITH THE DISCUSSION ON THE SUBJECT AT THE ACADEMY OF SCIENCES.

In the *Compte Rendu* of the sitting of the Academy of Sciences of February 13, 1843, I find that MM. Dumas, Boussingault and Payen have been led to adopt the following opinion concerning the origin of fat in the body of herbivorous animals, and of milk in the body of the cow.† To avoid erroneous interpretation, I extract, *verbatim*, from their Memoir, the passage which relates to it.

"According to this opinion, the fatty matters are formed principally in the leaves of plants, and they often affect in them the form and properties of waxy matters. In passing into the bodies of herbivora, these matters, forced to undergo in their bodies the influence of oxygen, experience in them the commencement of oxidation, from which the steäric or oleïc acid formed in fat results.*

"Although this system is very simple, it is difficult not to put on a parallel with it, an opinion naturally based on investigations undertaken by M. Dumas, and which he has already communicated to the Academy. Indeed, sugar may be considered as formed of carbonic acid gas, water, and olefiant gas. Now, there is nothing to prevent olefiant gas, on being separated, from assuming various states of condensation, and from fixing water in such a manner as to give rise to ordinary alcohol, to potato oil, to ethalic alcohol, and to margaric alcohol, &c."†

The following is a sketch of the investigations of M. Dumas concerning the formation of fatty matters, which I quote from the *Annales de Chimie et de Physique*, 3e *Série*, t. IV. p. 208.

"Liebig is of opinion that the herbivora form fat with sugar or starch, whilst MM. Dumas and Boussingault establish it as a general law, that animals, of whatever kind, do not form fat or any other organic elementary matter, and that they derive all their aliments, whether saccharine, amylaceous, fatty or nitrogenous, from the vegetable kingdom.

"If Liebig's assertion were correct, the general formula given by MM. Dumas and Boussingault, as resulting from the chemical statics of the two kingdoms, would be false."

From the above, there can be no doubt concerning the opinion of MM. Dumas, Boussingault and Payen, relative to the formation of fat in animals. It is the waxy matters, produced in the organism of plants, which are changed, in the animal body, into steäric, oleïc, or margaric acid.

Although the conversion of wax into fatty acids has never hitherto been observed, and although it is very difficult to conceive how a substance, which is not saponifiable, and whose melting point is much higher than the temperature of the animal, can pass into its blood in order there to undergo oxygenation, and conversion into steäric acid, this opinion, expressed by such illustrious chemists, whose talents are so generally recognized, would appear extremely probable to every one; I should have been tempted to have admitted it myself; but, before declaring myself, I was fortunately led to examine the excrements of a cow which had for a long time been fed with hay and potatoes, and I found, to my great astonishment, that these excrements contained very nearly all the fatty or waxy matter contained in the aliments. The cow, which daily consumes 15 kilogrammes of potatoes, and 7½ kilogrammes of hay, receives 126 grammes of matters soluble in ether; that makes in 6 days 756 grammes. The excrements furnish, in six days, 747^{gr}·56.

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* *Comptes Rendus*, No. 10.

Having given the Memoir on the Fattening of Cattle, and the Formation of Milk, in the department of AGRICULTURAL CHEMISTRY, we are constrained to do the same with the present article. Indeed, both come rather within the scope of Physiological Chemistry. The papers are given in the *Comptes Rendus* under the head of *Economie Rurale*, which is some warrant for our inserting them in the agricultural portion of THE CHEMIST.

† See THE CHEMIST, Nos. V. and VI., N. S., for May and June, 1843, pp. 212 and 265.

* See THE CHEMIST, No. V., N. S., p. 213.

† *Ibid.* p. 214.

But, according to the beautiful experiments of M. Boussingault, (*Annales de Chimie et de Physiqué*, t. LXXI.; p. 75,) which are perfectly in accordance with the daily results of our rural establishments, a cow, fed with potatoes and hay, in the indicated proportion, furnishes in 6 days 64^{kil}·92 of milk, containing 3,116 grammes of butter (according to M. Boussingault's analysis).

It is, therefore, absolutely impossible that the 3,116 grammes of butter in the milk of the cow can proceed from the 756 grammes of waxy matter contained in the aliments, since the excrements of the cow contain a quantity of matter soluble in ether, equal to that which has been consumed.

After this letter had been read, M. MAGENDIE rose and said:—"I am a member with our honorable brethren, MM. Boussingault and Payen, of a Commission, appointed by the Minister of War, which, for nearly a year, has been occupied with experiments concerning the feeding of the horses of the army. This Commission, which is on the point of terminating its labors, has already collected a great number of very interesting facts. We have occupied ourselves accessorily, with the question of the fat contained in the provender, admitting with chemists, that dry hay, for example, contains nearly 2 per cent. of a matter soluble in ether. We have taken account, in our experiments, of the liquid and solid dejections. In horses exclusively fed with hay, the dry matter of the latter contains 6½ per cent. of fat. If it is not all the matter called fatty, of the provender, which I would not affirm, the proportion of this matter in it is at least tripled. Consequently, this result greatly resembles, as regards horses, that which Liebig has just announced with relation to cows."

M. PAYEN replied, that if the experiments made by the Commission of the *Amirault* (the Commission appointed by the Minister of War) had presented results contrary to those obtained in the work executed in common by MM. Dumas, Boussingault, and himself, he would have been the first to perceive it, and would have hastened to inform his colleagues of it; but he could not see the slightest discordance between all these results.

M. Magendie has, doubtless, kept in mind only the fatty substances contained in the dried excrements, without taking account of the proportions of water, and of the total weight of the excrements in the normal state; nor, consequently, of the weight of the food which has disappeared by digestion: by regarding all these considerations, in order to establish exact comparisons, it will be seen that the rejected fatty matter, instead of being equal to the quantity contained in the aliments, and particularly in the hay mentioned, which contains much more than 2 per cent. of fatty matter,—is below that quantity.

Finally, so far from having fattened by feeding with hay alone, the horses rather lost in weight.

On this occasion, M. Payen added, that in order to reply at once to Professor Liebig's letter, and to an article on the same subject, which he had just received, he would show that the interpretation given by Liebig, of the very different results obtained by several chemists, in the analysis of maize, cannot be sustained. Liebig said, speaking of geese which were fattened by maize, it is evident that fat does not occur quite formed in their food, for maize does not contain $\frac{1}{1000}$ of fat or of similar matters.

To that we replied that maize contains from 7 to 9 per cent. of fixed oil, which is easily extracted, and that the presence of this oil is sufficient to explain its fattening power.

Liebig now replied that M. Lespes, in an old analysis of maize, found no oil, any more than M. Gorham; that M. Bizio found 1·5 per cent. in the grain; that he himself, in an analysis recently performed, in order to control ours, he found only 4·25 per cent. of oil in maize collected in his own garden, and altered by fermentation; that, without disputing our results, he thinks he has a right to say that, since maize is sometimes free from oil, since it sometimes contains 1·5, sometimes 4·25, and sometimes 9 per cent., it remains demonstrated that every one may draw, from the results furnished by the employment of maize in fattening, the consequence which best agrees with his individual opinion.

We reply, in our turn, that there is not, and that there never has been, maize without oil; that oil forms an indispensable part of all the cotyledons of *Graminaceæ;* that it amounts to 60 or 66 per cent. of their weight, in all the cases examined; that the cotelydon of maize, which is very bulky in proportion to the seed, contains this oil like all the others, and that the size of the cotelydon explains its preponderance in the grain of maize; that, besides, near the surface of a grain of maize, under the epidermis, cellules filled with an oily secretion are always found.

We should have thought it perfectly needless to explain to Professor Liebig, that if M. Lespes did not find oil in maize, it was because he did not look for it; that if M. Bizio extracted only 1·7 per cent. of it, it was because he employed insufficient means of extraction; and that if Professor Liebig obtained only 4·25 from rancid maize gathered in his own garden, it is perhaps because it was rancid.

We, who have simply taken the maize of commerce, arising from extensive culture, such as is employed as food, have found in it from 7 to 9 per cent. of oil. It is easy for us to produce such at pleasure, and we should be very desirous of seeing some maize without oil; for we cannot easily conceive its existence; and we strongly suspect that such maize would not have the same fattening power as the other, which we should be truly curious to verify by experiment.

We therefore persist in believing, that the starch of maize contributes little to the production of fat livers (*fois gras*); and that it is the oil of maize which performs the essential part in this phenomenon, the same as fat acts a similar part in the experiments of M. Magendie, in which the fat liver was developed in dogs, under the influence of a diet consisting, exclusively, of fatty matters.

M. **Boussingault** said that, being detained in Alsatia, it was impossible for him to participate in the investigations, undertaken at the instance of the Minister of War, concerning the feeding of the horses of the troops; that, nevertheless, having had means of making, in the country, experiments which respond to the wishes expressed by the Minister, he thought it his duty to devote his attention to the alimentation of horses. His observations related to 30 horses; they were continued during a year; and he would shortly have the honor of presenting them to the Academy; but, in the meanwhile, he thought it right to declare, that these results are entirely different from those just announced by M. Magendie.

M. **Magendie** said, in reply to M. **Payen**, that so far from having neglected the water of the dejections, and the portion of hay digested, he founded his remarks on these two facts, — by comparing the hay deprived of water, consumed in 15 days, with the sum of the solid dejections also deprived of water. By supposing 2 per cent. of fat in dry hay, we have 14 kilogrammes; by supposing 6½ per cent. in the dry matter of the dejections, we have 19$^{\text{kil}}$·5. The horses should therefore have rendered more fat than existed in the hay, without speaking of that which escaped by the other excretions. These results were obtained by M. Poinsot, a young chemist, of much promise, in M. Payen's laboratory; it appears to me that they are worthy of a place in a special Memoir on Fattening, if it were only to be refuted, if it were thought that good reasons for doing so existed.

I know that at the present time, and by new processes, it is no longer 2 per cent. of fatty matter that is found in hay, but 3 and even 4 per cent.; our experiments are, then, inaccurate, and must be recommenced. It must, however, be ascertained, whether, by applying to the dry matter of the dejections, the analytical processes which have shown that hay contains twice as much fat as was supposed, the same result will not be arrived at with regard to the dry dejections. Then my observations would subsist in all their rigor.

It is very fortunate for physiology, that such skilful chemists as MM. Liebig, Dumas, Boussingault, and Payen, devote themselves to investigations of this nature: great benefit must result to this science from them; but it must not be desired to go too far. It is doubtless important to know, that vegetables contain matters analogous to, nay, even resembling, the organic elements of animals; but in demonstrating from this, that it is these vegetable matters which exclusively form the tissues of animals, there is a great distance, which can be surmounted only by numerous and direct experiments. I do not doubt that the learned chemists whom I have just named, may execute them with success; but they do not at present exist, and, consequently, the question of the nutrition of animals still remains, as it has done for a long time, one of the most obscure points of the science. Let us hope that the labors of our honorable brethren will speedily elucidate it.

M. **Dumas** did not intend at present to defend the opinions of general physiology, which M. Magendie had just attacked. With relation to the question raised by Professor Liebig, he would call to mind that two opinions had been given concerning the origin of fat in animals. The first, by Huber, who attributes the origin of the wax of bees to the sugar which serves them as food;

the second, by MM. Tiedemann and Gmelin, who suppose that the fatty matters preëxist in the aliments of animals.

Liebig regards the opinion of Huber as the most probable. We, on the contrary, consider that that of Tiedemann and Gmelin is more in accordance with facts.

Moreover, we have been directed on our part, as Liebig has on his, by certain results of experiments, and by certain theoretical views. We have just viewed the state of the question concerning the fattening by maize; let us now consider its position relative to the employment of provender.

We have announced that provender, the husks of cereals, bran, and even straw, which were regarded as unimportant food for fattening, contain considerable portions of fatty matter. We have extracted 2 per cent. from hay, sometimes 3, and even 5 per cent. The other products, such as the husks of oats, recoupette,* have furnished from 5 to 6 per cent. We therefore found in provender sufficient fatty matters to explain the formation of butter and that of fat. Professor Liebig, on his part, expresses himself, at the same time, in the following manner:—

"Whatever may be the idea formed concerning the fatty matters in the organism, it is certain that neither the grass nor the roots eaten by cows contain butter; that the provender given to cattle does not contain beef-fat; that the parings of potatoes, with which pigs are fed, and the seeds eaten by poultry, do not contain the fat of the goose or the capon.

As soon as he was acquainted with our analyses of provender, Professor Liebig hastened to repeat them, and in this case, as in that of maize, he has recognised their accuracy; he was therefore mistaken in denying the existence of fatty matters in the aliments of the herbivora.

But he now starts other objections to the opinion which he combats. It is no longer a question of the total absence of fatty matters in these aliments, but of the proportions and properties of these matters.

Now, he finds, like us, that the fatty matter of the provender resembles wax, but does not comprehend how it could be converted into fat or butter. Professor Liebig, who, like us, seeks the truth, will permit us to observe that he, who very well understands that fibrin, albumen, starch, sugar and gum are converted into butter or fat, in the herbivora, comprehends, still better, how sugar is converted into wax in the bee. Now, since sugar would give, according to him, sometimes butter, sometimes fat, and sometimes wax, why should it be so unreasonable to suppose that wax, by an almost isomeric metamorphosis, might be converted into the fatty acids?

But let us not now go further. Liebig says, that the provender and other aliments of the herbivora, are void of fatty matters; we say, and we prove, that some of them contain much. With regard to their nature and properties, it requires time to make a complete study of them. We have not neglected it, as will very soon be seen.

Liebig reproaches us with not having taken account of the fatty matter of the excrements. We did so, and we have expressly said so in our Memoir. Only, our experiments differ a little from his, in the manner in which they are conducted. M. Dumas added, that it appeared to him, from glancing over Liebig's letter, that he had not made the experiment on the alimentation of the cow, which is related in it; that from several experiments, real and good in themselves, he had compounded a fictitious experiment, in which he had combined the most heterogeneous elements. The following, in fact, is a verification of the manner in which he proceeded:—

According to M. Boussingault, a cow, at Bechelbronn, ate 15 kilogrammes of potatoes, and $7^{\text{kil}}\cdot5$ of hay; it yielded, in six days, 64·92 litres of milk, containing about $3^{\text{kil}}\cdot116$ of butter. According to him, again, a second cow ate 15 kilogrammes of potatoes and $7^{\text{kil}}\cdot5$ of aftergrass; she furnished 24·7 litres of milk only in three days; each day she produced 4 kilogrammes of excrements. These two determinations, made at different periods, may be found in two distinct Memoirs.

Now, Professor Liebig takes the aliments of the first cow, and calculates their contents in fat, according to that of the hay of Giessen, which is the poorest in fatty matter that we are acquainted with. He takes the excrements of the second cow, and calculates their contents in fat, according to the cow-dung richest in fat which has been analysed at Giessen.

Finally, he includes in his calculation, the milk and the butter of the first cow, which are at their maximum.

It is thus that he arrives at this conclusion, that a cow, truly imaginary, which would have eaten, at Bechelbronn, hay of Giessen; which, eating as the first, would have furnished the excrements of the second and the milk of the first; which, eating the hay of Alsatia, would have produced in weight, the excrements furnished by the aftergrass of Alsatia, and in nature, those which the hay of Giessen would give; that such a cow, in fact, would give in its excrements, all the fatty matter of its aliments.

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* The article technically called "middlings?"

The butter of its milk must then have another origin. We will not dispute this conclusion; it relates to animals too chimerical for us to have any thing to do with them. We may here confine ourselves to saying, that the whole of Liebig's pretended experiment may be reduced to the following hypothesis: if it be supposed that a cow, which has eaten hay very poor in fatty matter, has given much milk, very rich in butter, producing much excrement very rich in fatty matter, will it not become very probable that the fat of the aliments did not produce the butter? Who does not perceive how easy it would be to upset the argument?

But these are fallacies in opinion, by which Professor Liebig does not wish to profit any more than we should do.

The truth is, that the quantities of milk may vary from simple to double, between one cow and another; that the proportion of butter may change in them from 2·2 to 4·8 per cent.; that the weight of the dry excrements may vary from 3 to 4 kilogram. per day; that the contents in fatty matter, aftergrass and dung, also singularly vary.

We do not hesitate to affirm, that if the cow which furnished the dung analysed by Liebig, gave 4 kilogrammes of dry excrement per day; that if it furnished 65 litres of milk in six days, giving 3,116 of butter,—it was because she ate hay much more rich in fatty matter than he was aware of. It is for Professor Liebig to inform the public how much reality there is in the experiment which he relates, and to divest it of all those fictions which he has mixed up with it, doubtless without perceiving the inconvenience to the interest of truth which resulted from it.

For our part, we have studied the question, and we have taken care to render our results perfectly comparable and homogeneous.

Professor Liebig will find in our Memoir, a series of experiments, made expressly on a milch cow, commencing from January 1, 1843, but operating on a single cow, by feeding it with analysed aliments, by analysing its milk, and by weighing and analysing its excrements. He will then see to how much care, and to what precautions a truly serious discussion of such facts is subjected, and how very inadmissable is the idea of applying to an animal relations of this kind, observed on another.

In the meantime, since Professor Liebig now admits that the aliments of the herbivora contain fatty matters which he did not suspect to exist in them, he will learn with interest that we have really committed an error, and that if certain hays gave us only 2 per cent. of fatty matter by ether, others can furnish 4 or 5 per cent. of it, especially when treated by processes more conformable to those of digestion. It will be easy for him to ascertain this, by submitting hay, and especially aftergrass, to the action of an acid before treating them by ether.

To conclude, we maintain that the provenders furnish quantities of fatty matter, which explains the effects of fattening and of lactation; that, ready to renounce this opinion, if necessary, we regard, at present, the view of MM. Tiedemann and Gmelin, who suppose the fatty matters to be all formed in the aliments, as best agreeing with known facts, and as being able to suffice for their explanation.

That, at all events, we think we ought to expect that Liebig has proved that an imperfect combustion may convert, in the blood, fibrin, albumen, sugar, and gum, into fatty matters, before admitting these transformations which, thus operated, appear to us always to admit as little agreement with the facts of physiology as those of animal chemistry.

ON MANURES AND THEIR COMPARATIVE VALUES.

BY MM. BOUSSINGAULT AND PAYEN.

The table of the analyses and comparative values of manures, completing this important Memoir, is unavoidably deferred until next Month.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

NUMEROUS INTENDED SECESSIONS FROM THE PHARMACEUTICAL SOCIETY.

It gives us great satisfaction to be enabled to inform our readers, that many chemists have communicated to us their intention of withdrawing their support from the Society. Of course, as they have paid their subscription for the present year, their names will remain in the list of members until next year, when not one of them will renew his subscription. Many inform us that they should have joined the Society, had they not been completely convinced of its utter inutility to them.

The annual general meeting of the Society took place in May, and on that meeting we have some observations to make, perhaps next month; we are unable to do so this month, having been compelled by pressure of professional engagements to defer writing this until so late a period of the month, as to render it impossible to accord to the subject sufficient time to do it justice. However, our readers may rest assured that we are not sleeping.

We have it in view to expose many abuses of various kinds, and among them the Pharmaceutical Society will come in for its full share of odium.

There is one point in Mr. Bell's last "leading article," which it may be well to notice. He says that but four persons have left the Society during the past year; but he forgets that the effects of our arguments have not yet had sufficient time to be felt. Let him defer his boasting on this point, until NEXT TIME THE SUBSCRIPTIONS BECOME PAYABLE. We rather think he will then be inclined to hold his peace. We assure him that we well know what we are about, and that the days of the Pharmaceutical Society are numbered. The time will shortly arrive when it will be known only to memory, or will sink into unregretted obscurity. As its existence has been unproductive of benefit, so will its decease be not only unlamented, but a subject of rejoicing.

For Mr. Bell, he cannot sink into obscurity more ignominious than the notoriety into which he has intruded himself; and his case may operate as a serious warning to those who would seek to escape from their proper place in society, and to force themselves into positions for which their talents and education do not qualify them. If he had kept to his business as a druggist, no one would have disturbed the noiseless tenor of his way; but when he wishes to persuade the world that he is a man of science, and a literary man—when we find him with two or three young men connected with the Society, actually enrolling himself a member of the Chemical Society, at a recent meeting of which we (having been passed in by a friend) beheld him,—we wonder at such a person presuming to a place among men of science. But there is no end to the ambition of some people.

A FEW MORE QUESTIONS FOR THE PHARMACEUTICAL SOCIETY TO ANSWER.

To the Editors of The Chemist.

GENTLEMEN,—

With your permission I avail myself of the pages of "THE CHEMIST," to submit a few questions in addition to those propounded by yourselves, for the consideration of the above "self-celebrated" Society:—

1. Does the Charter recently obtained elevate the members in any way whatever? or does it leave them where it found them; viz., mere traders?

2. Will the initial characters of the Society, viz. M.P.S.G.B! (how much more formidable than those of a member of the British Parliament!) be considered of any more (or even of as much) *real value, as regards talent and merit, than a degree purchased at a Scotch or Foreign University?*

3. Will the Society use its best endeavors to get the business of the Chemist and Druggist, elevated to a "Profession" in the forthcoming Medical Reform Bill?

4. Will the Society use its best efforts towards abolishing "Empiricism," in all its hideous and science-degrading forms?

5. Notwithstanding the gain acquired by the sale of Patent Medicines,—nostrums through which thousands meet a premature grave,—will the Society assist in uprooting the system thereof, in order to evince their strong regard for the public health?

6. Are not members seceding from the Society's ranks? As a proof that they are, I give you, in confidence, the name of a partner in a wholesale house, who told me he intended to withdraw himself.

7. Do the wholesale houses in the Drug trade, who are subscribers, attend the meetings, lectures, &c., or interest themselves in any way whatever respecting the Society?

8. Has not the Society found out the great blunder and unjust demand of making the Town and Country Members pay alike,

notwithstanding the manifest advantages of the former over the latter?

These few questions will suffice for the present.

I am, Gentlemen,
Obediently yours,
PATRIOTICUS.

[We suppose that we shall have to answer these questions, as we did those put by ourselves. It would almost appear that Mr. Bell will not undertake to defend the Society, right or wrong, against every assailant. Certainly, if he were to do so, his office would be no sinecure. He was evidently afraid to encounter THE CHEMIST.

The partner in a wholesale house, whose name "PATRIOTICUS" has communicated to us, shows himself to be a sensible man, and exhibits a proper regard for his respectability.—EDS.]

ON THE INJURIOUS EFFECTS AND NUISANCE OF OPENINGS INTO THE SEWERS IN PUBLIC STREETS.

BY CHARLES WATT.

HAD the Commissioners appointed by Her Majesty "to inquire into the State of Large Towns in England and Wales, with reference to the Causes of Disease," been composed of a fair and proper proportion of medical men, instead of the heterogeneous mixture which has been made up by the parties to whom the appointment has been confided, some important and beneficial results would, no doubt, have been attained: but what can be expected from the investigations of a set of men, five sixths of whom are utterly ignorant of the chief objects and proper course of such an inquiry as the one for which they are appointed?

Scarcely would the reader believe that the investigation of this subject, which is strictly and exclusively a medical one, and indeed one of the most abstruse and difficult within the range of that science, is entrusted to thirteen persons, of whom only three are at all connected, and that but indirectly and remotely, with the pursuits of medicine; while the remaining ten consist of a duke, a lord, a knight, a captain, an engineer and a builder; the other four being termed "Esquires," whose professions, if they belong to any, are not stated, and to whose names science is a total stranger, though no doubt they are well enough in their way. By the observation that the three other commissioners are but little (it might be stated not at all) engaged in practical medicine, no disrespect is intended to one so eminent as Professor Owen, whose attainments as a comparative anatomist are of the highest order, and command every acknowledgment; yet, surely, it will never be contended that the selection of practical physicians and surgeons ought not to have supplied their place. Of Dr. Lyon Playfair the world knows little, beyond his being the English translator of Liebig's work, (an undertaking which cannot be held as entitling him, by any means, to a very high position). It may, perhaps, be too much to assert that, by the selection of one rejoicing in a name so singularly incompatible with the motives which are well known to guide these appointments, it was intended to create a belief that it was chosen as an earnest of *fair play;* if it is too plain that it existed in name only, and not in deed, the fortunate few chosen, however, may congratulate themselves on their appointment over many fitter men who have been neglected. Our chief objection to Dr. Playfair's appointment is, that he is not conversant with the subject of investigation. Is it not evident, we would ask, that the whole proceeding, from beginning to end, is one totally destitute of any regard to the public good, and most indecently unjust to the medical body?

Of Dr. D. B. Reid, there is little of a scientific character on record, that can cause him to be regarded as calculated for the duties of the office he has accepted; it is not because we are disposed to flatter ourselves on our own acquirements and capabilities, that the public is to be cajoled into a concurrence, without either test or proof; and it may so happen, that while the Doctor is amusing himself with the fine dream of one day holding a very high rank among British chemists—that while he is labouring to become, or, rather, struggling to induce people to believe him something great, after the fashion of "aut Cæsar aut nullus,"—it might be better for him to take a much more correct and moderate view, and to keep in mind the "γνωθι σεαυτον," which will at once point him to nothing beyond mediocrity, or, in the end, he may be mortified to find that he must satisfy himself with being considered as "nullus." If he leaves no greater works behind him, than his ventilating projects, and his chemical preaching to the million in Exeter Hall, the world, especially the scientific portion of it, will pass him over as a mere "sounding brass and tinkling cymbal."

Ventilation, no doubt, is a very important subject (he has shown it to be a profitable one), and requires every care and attention, yet is it easily effected, at a trifling expense, without immense Lancashire chimneys, cowls, and other such complicated and cumbersome machinery, for the introduction of warm, cold, and fresh air, as are to be seen in the Houses of Lords and Commons, and which, in the buildings now being erected, will, it is stated, cost the country full seventy-five thousand pounds, and greatly interfere with their architectural design.

Of the various specimens to be seen at all parts of the town, rising out at the roofs of our public buildings, we cannot speak in admiration as to beauty of design; it would appear as if the trustees of these places intended to conspire with the doctor, to make our national monuments of genius vie with every old barn in the kingdom in the possession of this unsightly and lumbering appendage. The Queen's Palace, the Chapel Royal, and the Old Bailey, &c., are all furnished with the Doctor's wonderful ventilating machines; and so important are they deemed, that the fine old paintings in the Chapel Royal are held of no value, and have been mutilated to admit through the roof a large pipe like a great water main-pipe, to keep pure the air in a place where but a few scores of persons ever attend. There can be no objection to the Doctor's purifying experiments being tried at the Old Bailey, as the air and everything else is foul indeed in that locality.

Enough has been advanced to convince any rational being of the total unfitness of this commission for the office with which it is entrusted, and of the manifest disrespect and injustice with which the profession have been treated by those who have had the barefaced effrontery to concoct this scandalous job.

The foregoing facts have been stated in order to show how incompetent such a junto is to investigate the causes and means of obviating the commencement and extension of contagious and epidemic diseases; for it must be palpable, even to derision, that a builder, an engineer, a lord, or a captain, cannot be *much accustomed* to researches into the origin of "the pestilence that walketh in darkness;" and therefore we feel it incumbent on us to call the attention of the readers of The Chemist, and of the public, to the subject of those outlets lately contrived, through which the noxious effluvia of the sewers are exhaled directly into the very densest part of the population of the metropolis, and in the immediate vicinity of the houses of the inhabitants,—convinced that there is not the slightest hope of this nuisance being observed and condemned by the commissioners appointed, however diligent their exertions or unremitting their perseverance.

With the view, therefore, of invoking public attention, and of inducing the adoption of an immediate remedy, we shall proceed to give in detail the result of our personal observations on this most dangerous and filthy innovation.

It is quite clear that this foul and injurious evil must have been the work of some grossly ignorant persons, and it has arisen from the circumstance of two lives having been lost in consequence of the explosion of some coal gas which had escaped from the gas-pipes into the sewers, and was ignited by the candle of the workmen before alluded to. Thus, because of the bungling manner in which the Gas Company's operatives had performed their work, and of the occurrence of an accident which may never again happen, the health of the whole community is to be exposed to this highly dangerous and disgusting abomination.

Previously to the formation of these outlets or gratings, the only escape of any effluvia from the sewers into the streets took place at the gutters; and these, which are unavoidable, owing to their distance from the main sewer, from the constant transmission of water through them, and the smallness of their number in comparison with the present outlets which abound in every street, although bad enough both in principle and in practice, were harmless and insignificant. With the exception of the gutters, no other places of escape existed, but at the main terminations of the sewers into the Thames at various situations; and under the present system of the drainage of London,* it is difficult to conceive a more proper arrangement in regard to cleanliness, the security of the public health, and the prevention of offensive exhalations from arising into the streets, as will be evident by the following considerations:—First, because there the number of persons is comparatively trifling: Secondly, because the foul air in this open part is soon rendered harmless by its commixture with pure air: Thirdly, because the filth existing in the water, becoming at once immersed in the rapid current, is dispersed and carried throughout the whole course and extent of this vast river; and, Fourthly, because, in consequence of the ebbing and flowing of the tide, all accumulations of matters, capable of undergoing decomposition, and of engendering infectious malaria, are totally prevented. For these reasons, therefore, it must be obvious to every one, that the fewer openings into the sewers, among the population, is by far the more salutary arrangement, especially after the consideration of the facts I shall now proceed to detail.

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* At no very distant period I hope to submit a plan which will effect a much more effectual and salutary method of drainage, while it will have the further benefit of allowing of preservation of the refuse and offal of large towns for agricultural purposes.—C. W.

To the openings of late made into the sewers, and communicating with the streets, independently of the nuisance they present, the greatest objections exist, inasmuch as they are calculated in the highest degree to produce infectious and epidemic diseases. First, because they occur in places the most crowded by the population, and surrounded by the residences of the inhabitants. Secondly, because they are made in the closest proximity to the sources whence proceed the various disgusting and noxious matters continually emanating from privies, slaughterhouses, horse-slaughterers, and boilers, the refuse of the markets, of soap-houses and tan-yards, and of the different hospitals, and other places which are the receptacles of accumulated filth quite superfluous to be enumerated. Thirdly, because, from the smallness of the current of water in this portion of the sewers, compared with what exists near their termination in the Thames, the loathsome effluvia are far more copious, and in a much higher state of concentration and virulence, especially in hot weather.*

Not feeling satisfied, however, to rest my statement upon a mere theoretical view of the matter, although reason alone would be quite sufficient to satisfy any one of common understanding, that the nuisance is one of a very serious nature, I have made many visits at various times and to various places, and have observed the following facts, which will too plainly speak for themselves.

Early in the morning, when the humidity of the earth, after the heat of the previous day, is comparatively greater than that of the atmosphere, an exhalation having the appearance of aqueous vapor is visible, rising out of the grating, and giving out effluvia so offensive, as to satisfy my olfactory nerves in a very short time. In the day time, owing to the increased heat of the atmosphere, this vapor becomes invisible, but the odor is the same; and, unless there be a greater influx of water occasioned by the various operations going on during this period, the foul air comes up in noxious gusts, as any one, if he doubts, may easily satisfy himself. I repeated my visit to these places, in company with a friend, so lately as the 17th ult., and both of us were unable to endure the filthy odor given out at each place we stopped at to make remarks.

Surely none of our medical readers will disallow these facts, or concur in the continuance of a nuisance so disgusting, so deleterious, and so contrary to the plainest dictates of common sense; but upon the slightest consideration will at once denounce it as requiring an immediate remedy. With the view, therefore, of such a result, have I brought the subject before the public, especially as the present is that season of the year when the filthiness and danger are, as I have fully proved by trial, greatly increased, and therefore demand the most speedy attention.

That this necessary step would not result from the unaided observation and exertions of the commission lately appointed, no argument is needed to prove; the slightest reflection on the materials of which it is composed, and the motives which have dictated the choice, are quite sufficient to establish the fact, and to satisfy all, that the public weal is but little considered in such matters, when good jobs are at the disposal of those who want to benefit their friends, or such as can condescend to truckle to them.

SALE OF DRUGS BY PHYSICIANS.

To the Editors of The Chemist.

Gentlemen,—

Allow me, as a chemist, to thank you for your exposure of the practices of certain individuals calling themselves surgeons,apothecaries, &c. (of course they mean of the class who lived in Romeo's remembrance), who not only disgrace the professions with which they claim association, but do serious injury to the fair trader, to the very meagre benefit of themselves.

I believe that until lately the title of M.D. was free from such imputations; but now you will see by the copy of advertisement, herewith enclosed, that even a physician, or, at least, a person so styling himself, is endeavoring to astonish the good folks of Liverpool at the extraordinary opportunity he offers them of getting cheap physic and improving their health (?) by going to this *physician's shop* for everything but "paints, colors, dye stuffs, and deleterious substances not used in recipes." These the *Doctor* insinuates, in the politest manner possible, are the kind of articles "vended by chemists and druggists." But the Doctor does not mention whether he intends dealing in superior Bath bricks, besoms, brooms, brushes, blacking, black beetle poison, (but very probably the intellectual energy of this great man has been, for a length of time, devoted to this important subject, and in that case the poison would be "put up as a principal article,") and various other fancy goods; but, perhaps, the learned Doctor, in his bounteous goodness, intends to allow these also to be "vended by chemists and druggists;" yet I have no doubt, if the talented and worthy M.D. were asked for any of these little articles, rather than disappoint his customers, whose visits I have no doubt are rather *angelic*, they would be found in his stock, and, of course, of the same superior quality as his cheap medicines. I will not further occupy your valuable space, but leave the great doctor in your hands, feeling assured he will meet with what he deserves.

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* It may be proper to state that the power of matter in a state of decomposition to generate disease is much increased when that matter is in contact with a certain quantity of water, and is more infectious than when it is comparatively dry. This may arise from the aqueous vapor carrying along with it the noxious particles in a state of greater density and concentration, or from its rendering them more susceptible of absorption.

I am, truly yours,
June 2, 1843. LEAMINGTON.

The following is a copy of the precious advertisement referred to by our correspondent:—

"TO FAMILIES DESIRING A DIMINUTION OF THE EXPENSES OF MEDICAL ATTENDANCE WITH PERFECT SECURITY IN THE PREPARATION OF MEDICINES.

"Without dwelling upont he advantages, which are sufficiently obvious, of a Physician compounding the Medicines he himself prescribes, Doctor Hickson, Graduate in Medicine, Trinity College, Dublin, Surgeon, Accoucheur, &c., solicits attention to the Pharmaceutical Arrangements he has made for supplying, not only to his own patients, but to the public generally, pure and unadulterated medicines, exempt in their preparation from the risks and objections so much complained of. Resting his pretensions on his qualifications and acquaintance with the treatment of diseases, and on his determination and ability of securing to his patients so important a saving, (by affording, of himself, all the requisite aid of a physician and accoucheur, with appropriate and correctly prepared medicines,) as must ensure the approbation of all classes, Doctor Hickson enters into no invidious comparison between those of others and his own establishment, which is purely Medical, and similar to what is kept by the General Medical Practitioners of London and Dublin, who, while they afford to persons requiring them, opportunities for obtaining the purest medicines, and having prescriptions safely dispensed, consider the sale of paints, colors, dye-stuffs and deleterious substances, not used in recipes, together with the miscellaneous articles unconnected with medicine, vended by chemists and druggists, if not dangerous, certainly incompatible with their duties, as physicians and surgeons. The demand for domestic remedies becoming every day more general, Dr. Hickson will, together with Patent Medicines of established character, be constantly supplied with several useful preparations, among which will be found a compound Syrup of Iceland Moss, much approved of by many families, as a safe, palatable, and valuable cough remedy, a compound Syrup of Sarsaparilla, a highly concentrated and efficient preparation of that medicine, female Aperient Antibilious Pills, constructed on due consideration of the peculiarities of the constitution of females, and their diseases,—Aperient Antibilious Pills, adapted to both sexes, &c. &c.—The poor, attending at Dr. Hickson's, will be prescribed for, and left at liberty to procure medicines where they like.—21, Upper Hill Street, Toxteth Park."

We are obliged to our correspondent for calling attention to this disgraceful advertisement.

It is to us some matter of surprise that the Liverpool druggists do not set this man on his proper footing, by means of the local papers.

This system, notwithstanding the ignorance of the practice of Pharmacy common to such persons as this "Doctor," is calculated to injure the legitimate chemist and druggist in the fair and lawful exercise of his calling.

We have ever maintained, and shall continue to do so, that the chemist and druggist requires a special education and qualification, and that he ought to undergo an examination in Chemistry, Botany, Materia Medica and Pharmacy, previous to being admitted to practise. This should be compelled by law, and the examinations might be conducted by efficient persons appointed and paid by Government, certainly not by the Pharmaceutical Society. We should propose, that every one passing such examination should be licensed, irrespective of the school at which he obtained his knowledge. No general practitioner should be allowed to dispense other prescriptions than his own, without a license from these examiners.

Moreover, the practice of druggists might be carried on under regulations which would prevent the recurrence of such cases as the above.

As for *Dr.* Hickson, he is not worthy of notice; and we must hope, that with the caution of the Medical press, the eyes of the Liverpool public will be opened to the evil tendency of the system adopted by this person.

Not contented with endeavoring, by fair means, to wrest the trade in Drugs from those to whom in right it belongs, this creature actually goes so far as to make highly invidious comparisons between the system adopted by him and that which prevails among chemists and respectable general practitioners. We hope that our Liverpool friends will keep a sharp eye on the Doctor's practice.

It ever affords us sincere pleasure to evince our interest in all pertaining to the welfare of chemists, and we shall be glad to receive from our readers, particulars of such cases as this whenever they may present themselves.

Such advertisements, unfortunately, are not uncommon in the country; and we should feel obliged by our readers sending us copies of such as may meet their eye, stating the newspapers in which they are printed.

ON THE USE OF MALT LIQUORS.

REPLY OF "VIRTUTAS" TO "MEDICUS."

To the Editors of The Chemist.

GENTLEMEN,—

I have heard it remarked that a shilling is not ill spent, if it buys a hearty laugh; if so, I was amply repaid in the purchase of the last No. of your periodical; for not only did I reap the benefit of its usual valuable information, but my risible organs were most agreeably excited, by the very grave manner in which "MEDICUS" informs me, that he has not two stomachs, the one for the digestion of his *bread*, the other for that of his *butter*. He sets me down as an ignoramus of the first water, and gives a childish leer at the *sentimentality* of my letter: I point to the unwarrantable epithets with which he stigmatizes those who differ from him in opinion. In support of my reply to his first communication, allow me to offer a few very brief remarks upon the merits and demerits of alcohol.

The composition of alcohol shows it at once to be incapable of supplying the animal economy with any particle of *nourishment*, since it is incontrovertibly proved that animals can derive no support if kept upon substances destitute of nitrogen. And further, although the human frame is a laboratory invested with the most mysterious and admirable powers of transformation, we have no evidence to show that it can produce any one element from an article originally divested of it. Hence the inference rationally drawn, that alcohol is essentially a non-nutrient; an idea far too unpopular. Alcohol is a prolific source of *animal heat.* Its elementary constituents combine with the oxygen of the body, being converted into carbonic acid and water; there existing a stronger affinity between *them* and the oxygen, than between the oxygen and the compounds formed by the continual disorganization of animal matter. Whence comes this oxygen? Evidently from the arterial circulation; as we know of no inlet for it save that of respiration; passing by, of course, those morbid states where emphysema indicates the unnatural and unwelcome presence of atmospheric air. Now, mark the result of this expenditure of the oxygen. A check must necessarily be put to that decomposition so essential to the sanatory condition of the animal machine; the arterial blood being no longer able to conduct the process, not having sufficient of the *needful.* The transformation from arterial to venous blood takes place, yielding a supply of animal heat, but without any corresponding muscular developement. *Ergo,* alcohol is a *bad* source of animal heat. Alcohol is a *stimulant,* and surely little need be said of it here. "MEDICUS" appears to have prescribed it; and I think he has selected the best vehicle for its exhibition, as the tonic bitter of the hop with saccharine and mucilaginous matter form not only grateful but beneficial adjuncts. Would that it were more under the command of the medical man; for surely those in perfect convalescence require its stimulants no more than does the infant the condiments of the epicure. All this is my "absolute nonsense;" this, my daring "effrontery."

Let not "MEDICUS" imagine that I am so wedded to my creed as to be impervious to conviction: sorry, indeed, should I be to find myself holding sentiments which I would shrink from introducing into the field of open and impartial discussion. He tauntingly called upon me for proof: I have given it. He proposed that I should reconsider my communication: I have done so. He felt confident that I should recant. He is mistaken.

With him, I shall be happy in seeing the *morale* of the matter transferred to the pages of some more congenial periodical; only observing, that, with my present sentiments, I shall never cease to vindicate the claims of total abstinence principles; principles which my opponent admires in theory, but which he has neither the virtue nor moral courage to defend.

Thanking you, Gentlemen, for the insertion of my first, I *again* venture to sign myself

VIRTUTAS.

[We wish that our correspondents would attack the subject instead of each other. It is really a pity that men cannot discuss a debateable topic without giving their opponents so much of the *argumentum ad hominem*. We hoped that there would have been some useful results from this discussion; as, doubtless, there would have been, had it been conducted with temper and ability.

We must beg of them, if this controversy be continued, to be more mild in the terms which they apply to each other. Our pages are open to the science and even the *morale* of the question, but we cannot allow our readers to be annoyed with the exhibition of personalities.]

ON THE PREPARATIONS OF THE CITRATE OF IRON.*

BY M. MIALHE.

TAKE of crystallised citric acid, 3 parts; hydrated peroxide of iron, 2 parts; distilled water, 12 parts. Boil together until the oxide is completely dissolved; then filter, and add enough water to replace what has been evaporated, and make up 12 parts of fluid. If we wish to obtain the citrate dry, a layer of the fluid is placed on a square of glass and evaporated in the stove. The citrate of iron thus obtained is of a fine rusty red color; dissolves perfectly, though slowly, in water; is of a strong acid taste, astringent, and slightly styptic.

Within the last few years—that is, since the citrate of iron has been introduced as an article of trade—two very distinct varieties are to be found in chemists' shops. One presents the characters just mentioned, and is the pure citrate of the peroxide of iron. The other is a preparation of a very different kind; it dissolves much more quickly in water, and the solution, instead of being a yellowish red, is of a yellow-green color; its taste is rather alkaline than ferruginous; in a word, it is a double citrate, containing a greater or less proportion of soda or ammonia.

Now, as it seems clear that these two preparations must possess different medical properties, I think that physicians would do well if they would distinguish, in their prescriptions, the acid from the alkaline preparation.

EFFERVESCING CHALYBEATE WATER.

Water, 625 scruples; dry citrate of iron, 1 scruple; citric acid, 4 scruples; bicarbonate of soda, 5 scruples: add first the citrate of iron and citric acid; then the bicarbonate of soda, taking care to cork the bottle at once, and secure the cork.

This latter preparation has a very little metallic taste, and is quite as agreeable as the Vichy water; when mixed with wine, it does not render it turbid as Vichy water does, and is certainly a more active remedy.

INCONTINENCE OF URINE SUCCESSFULLY TREATED BY NITRATE OF POTASSA.*

BY J. YOUNG, M.D., OF CHESTER, DELAWARE COUNTY.

ENEURESIS is so disagreeable and loathsome a disease, and frequently so difficult to manage, that the following cases, with their treatment, may not be devoid of interest to a portion of the practitioners of our art; inasmuch as the article used, it is believed, is not to be found among the means generally recommended by authors for that purpose.

In the winter of 1828, I was requested by my friend Dr. R. C. Marsh, one of our oldest, most intelligent and most experienced practitioners, to take charge, during his absence, of a highly respectable lady, about 50 years of age, suffering from incontinence of urine. He informed me that all the means that are usually prescribed had been used in this case, and had failed; that he had been trying, for more than a week, the tinct. lyttæ of the *Pharmacopœia*, and he now had prepared a saturated tinct., which he proposed using, and to which I at once agreed.

The perinæum was then sore with a blister; and the saturated tincture was given in rapidly increased doses, until a teaspoonful three times a day was given. It produced no effect whatever; but on the fourth day of its use, I found her affected with a tolerably violent catarrh, with cough, coryza, considerable fever, an irritable pulse, and an exceedingly irritable state of the system. There was no change in the eneuresis.

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* *Bulletin de Thérapeutique;* and *American Journal of the Medical Sciences*, April, 1843.

* From *The American Journal of the Medical Sciences*, April, 1843.

Deeming it improper to continue the course agreed on by Dr. M., under this state of things, the tincture was discontinued, with the intention of resuming it again as soon as the catarrhal affection had subsided. A saline cathartic, with demulcent drinks, bathing the feet at night, and a dose of paregoric at bed-time, were recommended. This was February 5, 1828.

7th. I saw her again—found her much relieved of the catarrhal symptoms; there is still, however, some feverishness and irritability, without the least improvement in the original complaint. Directed nitrous powders, 10 grains every three hours, and continue demulcent drinks.

9th. She is entirely relieved, not only of the catarrh, *but also of the eneuresis.* She was as much rejoiced at this result as I was surprised. She said, that after taking a few doses of the powders on the day they were first used, the incontinence ceased, and has not yet returned. I ordered a gradual withdrawal of the medicine, and did not see her again, as the period of Dr. M.'s absence was about expiring, and he would again pay such attention as the case might require. I subsequently learned that it did not return, and that the cure was complete. This was the first case of the kind I had ever seen, and its accidental cure made an impression on my mind that has been of advantage since, in the treatment of similar cases. It is, fortunately, not very common, in country practice at least; as I have met with but five cases of it since—three females and two males. The first and only prescription used in each case, was *ten grains* of pulverised nitre every three or four hours, with flax-seed tea to drink; and they have all yielded within 24 hours of commencing treatment.

Supposing that the same treatment might be serviceable in congenital incontinence, or where children from five years old and upwards wet the bed, I have tried it in one case, and with complete success.—A boy between nine and ten years of age, who rarely in his life had escaped wetting the bed one or more nights in the week, was ordered 10 grains of nitre three times a day for a week; during this time he escaped his filthy practice; it was omitted three days, and then ordered to be given four days in the week, omitting it three. It was thus continued five weeks, when it was entirely discontinued, he not having wet the bed since he commenced taking the nitre; nor did it return so long as he was under my notice—more than a year after. I have had no opportunity of trying it in any case since; but, should any occur in future, I shall certainly give it a fair trial.

I have supposed that the *modus operandi* of the nitre in these cases may be, by increasing the irritating properties of the urine, thus making it more stimulating to the bladder, or its sphincter. If so, other preparations of potassa or soda may be found serviceable in cases in which the nitrate may not succeed; and it thus opens a field of new resources from which we may bring relief, which could scarcely be found otherwise, to some persons suffering under one of the most disagreeable diseases human nature is subject to.

Perhaps the mode of treatment here used may be an old one; if so, I know not where to find it recommended,—certainly not in any of the authors that have fallen in my way.

ABUSE OF PURGATIVES.*

It has been maintained by physicians in the East Indies, and in our southern and western States, that purgatives and calomel were not only essential to the treatment of the diseases of warm climates, but that it was necessary to administer those remedies in doses which have been regarded by the practitioners of more temperate regions as not only extravagant, but absolutely injurious. The following remarks by Drs. Samuel Rodgers and Alex. Lorimer, the able editors of the *Madras Quarterly Medical Journal,* show that the medical practitioners in the East are awakening to the fact that the extent to which they have employed those remedies is pernicious, and we hope that our brethren in this country will have their eyes opened to the same truth.

"In all the diseases of this country [East Indies], however trivial, nay, even in the diseases of infancy, the strongest purgatives are prescribed, particularly mercurials. But as we daily see indications of a better mode of practice creeping into use, the scruples of calomel being by many practitioners changed for small doses of blue pill, and other mild purgatives, we are in hopes that, as

'Opinionum commenta delet dies,'

we may live to see the day when this perni-

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* *Madras Quarterly Medical Journal*; and *American Journal of the Medical Sciences*, April, 1843.

-cious practice shall be altogether discarded; and that the real meaning of the terms, 'the use and abuse of purgative medicines,' shall be more thoroughly understood."

NEW TEST FOR CORROSIVE SUBLIMATE.*

To the Editor of The Medical Gazette.

Sir,—

Allow me, through the columns of your Journal, to call the attention of those interested in the science of toxicology, to a method of detecting corrosive sublimate, which I am not aware has been previously brought before the public.

It is now upwards of two years since, reflecting on the strong affinity of metallic silver, both for metallic mercury and for chlorine, I triturated a grain of corrosive sublimate with several grains of pure metallic silver in powder, as it is procured by precipitations with copper from a solution of the nitrate, and in a dry state; and I was soon encouraged by the blackened appearance of the mixture to believe that decomposition of the bichloride had taken place, in some degree at least; and that the decomposition was complete became evident when, upon placing the powder in the bulb of a small tube (such as is used in reducing metallic arsenic), I obtained a distinct ring of metallic mercurial globules in the neck of the tube. Since that time, in obtaining metallic mercury from corrosive sublimate, I have always used silver, which I have not known to fail in producing its reduction, and have found much more convenient and manageable than the potassa fusa commonly employed; this last not being easily pulverised, and attracting moisture to an inconvenient extent very rapidly. This objection, however, scarcely applies to the use of the bicarbonate of soda or potassa.

I have subsequently endeavored to ascertain whether metallic silver possessed the same power, and to what extent, over corrosive sublimate in solution; and in successive trials I have been able to obtain distinct, nay abundant, metallic globules from the amalgam formed by boiling metallic silver in a solution containing one grain of corrosive sublimate in four ounces of distilled water, and even in a solution half that strength, *i. e.* of one grain in eight ounces. My time does not allow me to make numerous comparative experiments, but I am disposed to believe that silver acts slowly or not at all on solutions of corrosive sublimate at the ordinary temperature.

I next tried this method of experimenting on organic mixtures; and having added one grain of corrosive sublimate to four ounces of tea, made with sugar and milk, I boiled the liquor with the powdered silver, and after allowing time for subsidence, the fluid was poured off. Liquor potassæ was boiled for some time upon the metal, to dissolve organic matter, and liquor ammoniæ afterwards added to the sediment to dissolve the chloride of silver. This was also poured off; and the sediment, having been washed and thoroughly dried, was placed in a tube as before, and metallic mercury obtained in abundance.

Two other experiments have also given very satisfactory results; in one of which, one grain of corrosive sublimate, dissolved in a little distilled water, was mixed with a gelatinous fluid, made by diffusing ʒj. by weight, of the patent gelatine of the shops, in ℥iv. of New River water. In the other, one grain of the same substance in powder was added to five ounces of a sanguineous fluid, which had been obtained five days previously, by tappings from the head of a hydrocephalous infant. The only modification in these cases was, that the mixture was acidulated with hydrochloric acid, before adding the silver; this proceeding having been suggested by M. Reinsch's plan of testing for arsenic. It is necessary to moisten the silver by agitating it with a little distilled water in a tube, before adding to the suspected mixture; but in the cases detailed, the metallic sediment has been very easily obtained, subsiding rapidly, and the results have been very satisfactory.

No actual case of poisoning has occurred to me since I have tried this method, and my professional engagements leave me little time for the investigation of its powers; but I submit it to your readers, not without a hope, that in other and more skilful hands it may be productive of important results.

I have the honor to be, Sir,
Your obedient Servant,
Algernon Frampton, M.D.
Assistant Physician to, and Lecturer on Toxicology at, the London Hospital.
29, *New Broad Street*,
May 31, 1843.

GRINDERS' CONSUMPTION.*

Dr. Calvert Holland, of Sheffield, has published a communication, in which he draws the attention of the profession to the prevalence of consumption in that town, chiefly among workmen engaged in what is called dry grinding. The principal productions of Sheffield—cutlery and edge tools

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* *Medical Gazette*, June 9th, 1843.

* *Medical Times.*

—are all ground upon either a dry or wet stone—many upon both; on the dry stone first and the wet one afterwards. The injurious effects of the occupation belong particularly to dry grinding, and the evils which it produces are comparatively of modern origin. Previous to the employment of steam as a propulsive power, the grinding wheels were situated on the banks of rivers, the workmen thus having the advantage of fresh air and exercise; or when erected in the town, free ventilation was effected by dilapidated roofs, shattered doors and broken windows. At that time dry grinding was almost unknown. The introduction of it has been owing to the gradual diminution in the scale of wages. The one process is much more expeditious than the other, and is now very generally employed. The modern grinding wheels are all built in the town, without any regard to ventilation, and each room is occupied by eight or ten persons belonging to the different branches; clouds of dust arising from the stone consequently envelope the grinder, and play about the head, the respiration being continually disturbed by the inhalation of the numerous floating particles thereof. The injurious effects of the occupation are greatly aggravated by poverty, over-exertion and dissipation, to which the workmen all give way. The greatest danger attends the grinding of small articles, as needles, penknives, scissors, razors, and forks, the face of the workman being necessarily within a few inches of the stone, so that it is quite impossible to avoid the inhalation of the dust, which is composed both of gritty and metallic matter; and in needle grinding, the concrete masses of it which are formed have almost the specific gravity of iron. The earliest inconveniences experienced are occasional irritation in the larynx and trachea, exciting cough and slight expectoration of saliva colored with the inhaled dust—so much so as sometimes to be quite black: a dryness of the throat also generally exists. The symptoms do not perceptibly disturb any of the functions of the system, and many continue for several years without any serious aggravation. In some cases, however, where the constitution is defective in tone and vigor, showing a scrofulous or leucophlegmatic tendency, the expectoration soon loses the condition of simple saliva, and purulent-like matter is observed mixed with the inhaled dust. The constant irritation of the mucous membrane of the trachea and bronchi causes it gradually to lose its natural sensibility; so that the inhalation of the dust, though baneful in the extreme to the whole of the respiratory organs, is modified in its influence by the diminished susceptibility of the delicate secreting surface. The trachea and bronchi are, therefore, less frequently the seat of serious morbid changes than would be anticipated from the constant action of the exciting cause. Dr. Holland believes that the fine particles of dust are often conveyed through the minute bronchial ramifications to the lungs, and there give rise to structural alterations; and he remarks, "it is impossible to conceive how, in the ordinary process of respiration, the finest particles should not be conveyed into the pulmonary substance. There is nothing in their structure to prevent it." The relief afforded in cases of difficult breathing by expectoration of a brown or black gritty sputa he regards as confirmatory of his opinion. The color and character of the expectorated matter establish the inhalation of dust, and in numerous instances, the fact that it has long existed in the respiratory organs. The great mortality among grinders is from 21 to 35 years of age; the delicate in constitution and the wretched in circumstances break up long before the latter period, from degeneration of the lungs, presenting the ordinary symptoms of tuberculous phthisis. With very limited exceptions, the few who live beyond 35 years of age—in the most deleterious branches of grinding—present symptoms of an enlargement of the bronchial tubes and an expansion of the pulmonary tissues. When the constitution is vigorous, and the individual possesses a well-developed chest, the injurious influence of the dust is, to a great extent, confined to the production of bronchial irritation, at least for a considerable period; the result of which is a frequent and severe cough, existing for several years, unaccompanied with any morbid derangement of the animal economy. The pulse is but slightly, if at all, accelerated; nor do we observe any fever or disturbance of the digestive powers. The continuance of the cough excites little anxiety in the artisan, interfering in no way with his daily occupations. At length, however, he complains of difficulty of breathing, which is aggravated on every exertion, whether of walking or coughing, and then he is regarded by himself and others as attacked with asthma—a term which is almost universally employed at Sheffield to designate his symptoms. This form of disease is no certain protection against the inroads of further pulmonary degeneration, as tubercles, hepatisation, or any other structural change. The enlargement of the bronchial tubes, on which it would appear chiefly, if not exclusively, to depend, affords, nevertheless, to an important degree, such protection; and the longest lived amongst the diseased grinders by many years are found among the asthmatic class. The workmen who die of consumption frequently exhibit traces of active inflammation in some of the organs of the chest; in some the pericardium is thickened and adherent to the heart; but the most common effects observed are strong attachments between the pleura of the lungs and the internal surface of the thorax. In some instances they are exceedingly firm, formed by strong bands of effused lymph several lines in thickness. The history of the cases seldom affords any accurate information respecting the origin of such changes.

SYMPTOMS CAUSED BY THE VARNISH OF AN APARTMENT.*

Some facts have already been published, which show that the vapors of essence of turpentine may give rise to more or less serious inconveniences; the following is a new example of what may result from staying in air impregnated with these vapors.

E. J., aged 24, of a sanguineo-nervous temperament, inhabited a small room, the paper of which had been fresh colored with a layer of paste, then with a varnish prepared with resins, alcohol and essence of turpentine. The layer of varnish, which had been applied eight days, still gave out an odor of varnish, but this odor was bearable. The first night that E. J. lay in this chamber, the season not allowing him to leave the window open, he shut it; the odor of the essence was developed, and it became more and more intense; it was especially perceptible at the end of some hours, in consequence, doubtless, of the heat produced by a long stay in this small space.

E. J., despite the odor of turpentine, which went on increasing, went to bed, and slept without perceiving anything. He had been asleep some hours, when a friend came to see him, who had no sooner entered the room, than he experienced uneasiness, and immediately opened the window.

The sleeper, who was awakened in consequence of this visit, was quite surprised to find himself almost inundated with perspiration; he was in a state of considerable weakness, experienced nervous convulsions, violent headach and unquenchable thirst.

After some time, the air of the apartment having been renewed, he experienced relief; but he was obliged to leave his window open all night.

The second night these same inconveniences were renewed, but in a slighter degree. He took care, on the third day, to disengage chlorine in his room; all the issues having been perfectly closed. Some hours before retiring to rest, he opened the window, in order to allow the odor of chlorine to be dissipated. Finally, at 10 o'clock, his hour for retiring, the odor of chlorine and that of turpentine could no longer be perceived. He closed his window, and went to bed; after some time, the odor again manifested itself, but to a slighter extent; still it was not supportable.

The third and fourth nights he was obliged to leave his window open; but the fifth, he could without inconvenience sleep in the room with the window closed.

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* *Journal de Chimie Médicale*, June, 1843.

ON AN EMETISED POWDER FOR DESTROYING RATS.*

For some time, many *pharmaciens* have sold a powder, called *Le Philanthrope Muophobon*, for the *destruction of rats and mice* (*without arsenic*)*; from Jacques Salomon and Co., Paris.* This powder is sold by *pharmaciens* without any caution, and as not being dangerous; it is, however, a violent poison, as the analysis which I am about to relate will fully show.

Treated by water, it deposits white crystalline grains, in very coarse powder, which may easily be separated from a lighter powder, which I recognised as farina. The small crystals, projected on burning charcoal, give out the odor which characterises the tartar emetic in decomposition, without any mixture of the garlic odor of arsenic; the solution reddens litmus, and forms, by means of sulphuretted hydrogen, an abundant orange yellow precipitate; it gives, with sulphuric acid, a white precipitate; with a sheet of iron, a deposit of metallic antimony. Introduced into a Marsh's apparatus, it gives numerous antimonial stains; exposed to the fire, it is decomposed, turns black, and is carbonised.

The proportion of emetic contained in this powder is very considerable; for 10 grammes yielded, in two successive analyses:

$$\left.\begin{array}{l}\text{1 gramme 9 decigr.}\\ \text{1 gramme 7 decigr.}\end{array}\right\}\text{sulphuret of antimony,}$$

which represents 31 to 32 per cent. of emetic.

I have thought it worth while to publish the result of these analyses, in order to guard against the accidents which might result from the use which evil-disposed persons might make of this eminently dangerous powder, imprudently delivered without difficulty, by *pharmaciens* who, doubtless, are ignorant of its composition.

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* *Journal de Pharmacie et de Chimie.*

POISONING BY ARSENIOUS ACID TREATED BY DIURETICS.*

BY DR. AUGOUARD.

It is known that numerous discussions have been raised by the Royal Academy of Medicine, as to whether, in cases of poisoning by arsenic, the secretion of urine ceases, and whether or not diuretics should be employed in poisoning of this kind, as M. Orfila indicated.

On the 23d of February, 1843, at about 3 o'clock, I was called on to attend a midwife, who, about half an hour previously had taken fifteen grammes of arsenic, which she had procured by means of her diploma, from three color merchants. I observed the following symptoms:—

Violent pains and burning sensation in the epigastric region; it would not bear to be touched; retchings without dejections; ardent thirst, without any marked desire of quenching it; however, the patient swallowed what was presented to her with a convulsive motion in the jaws, capable of breaking glass; state of contraction in the inferior as well as in the superior members; the extremities of these members were cold; the pulse was less frequent, and the respiration slightly accelerated; the face was vultuous at intervals; light appeared to be perceptible to her, and the eyelids were often closed; countenance sharp and penetrating; intellectual faculties unimpaired.

TREATMENT.

A decigramme of stibial tartar was immediately administered in two doses, in two glasses of water. The first glass procured a very abundant vomiting of blackish and mucous matters. Other vomitings, induced by the water of nitrated marshmallow, seemed to bring up no other substances than those which we have just described. Strongly nitrated marshmallow water, administered in large quantity, was the principal basis of the treatment followed: notwithstanding that, we could obtain urine only at 10 P.M., seven hours after the poisoning; and this urine, which was very abundant until next morning at 8 o'clock, amounted to about 10 litres.

On the 25th, sharp pains in the stomach; application of 12 leeches to the epigastrium; prescription of a bath of two hours, emollient cataplasms, continuation of nitrous drinks and baths. Convalescence at the end of eight days: fifteen days after, the patient appeared completely cured.

POISONING BY ADULTERATED TAPIOCA.

A case of poisoning by copper has been recorded in the *Auxiliaire Bréton*, caused by the ingestion of tapioca. The editor of that Journal attributed it to the green substance employed in coloring the wrappers of the tapioca, but the following seems the more feasible. In order to prepare the tapioca, the fecula of the potato, moistened with water, is thrown upon a plate of copper, heated to 212° Fah., when it immediately forms into unequal, hard, brittle lumps. The plate is not always kept clean; and if, when the preparation is finished, care is not taken to remove all the moist grains of fecula adhering to its surface, they get mixed with the hydrate and subcarbonate of copper, a very small quantity of which is sufficient to poison a large quantity of tapioca. If the fecula which is used has undergone a slight degree of fermentation (it will then contain a certain quantity of acetic acid), the copper plate will be slightly acted on, and the tapioca will contain a small quantity of acetate of copper, quite sufficient to render the article dangerous. The presence of the copper may be easily detected, by making a hot jelly with the suspected substance, adding a few drops of vinegar, and keeping the clean blade of a knife in it for a quarter of an hour. If copper be present, the steel will be colored by it in that time.

LEMON-JUICE IN DROPSY.

BY DR. SCHWABE.

Dr. Schwabe, of Gros-Rudestadt, reports the case of a man, seventy-five years of age, the subject of dropsy, to whom, as if in the last extremity, he was hastily called. For several weeks the patient had been able to maintain only a sitting position, his hands and feet were enormously swollen; there was extensive fluctuation all over the abdomen, and the scrotum was so tumified that the penis was scarcely perceptible. The pulse was feeble and intermittent. Dr. Schwabe at first prescribed acetic ether, which he afterwards combined with lemon-juice, ordering a table-spoonful of the latter, freshly expressed, every two hours. All kinds of fluid, besides, were rigidly prohibited; the food consisting of three ounces of (white) meat, and as much bread, three times a day. On the second day after the adoption of these means, abundant diuresis ensued, with a diminution of the pains previously felt in the chest. The dose of lemon-juice was increased to half as much more. The urinary secretion now became so abundant that six quarts of urine were passed in twenty-four hours. From this time the patient was able to lie in bed, and he slept well for several hours. The pulse rose, and ceased to be intermittent; the swellings of the abdomen and extremities gradually decreased. The strength of the patient became renovated; digestion improved; and the stools were solid and duly colored; and towards the end of the treatment indicated, which continued for three weeks, the quantity of urine daily passed had decreased to its natural quantity. Less doses of lemon-juice were now adopted; and by the thirtieth day of the treatment all the symptoms of dropsy, even the œdema, had vanished. In two months, the patient had become enabled to resume his daily occupation.—*Casper's Wochenschrift.*

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* *Journal de Chimie Médicale*, May, 1843.

* *The Lancet*, June 24, 1843.

Dr. Drechsler, of Köthen, relates cures of a similar nature. A man 55 years of age, suffered an attack of ascites with hydrothorax, dry cough, diminished urine, abdominal fluctuation, œdema of the legs, &c., attended by a continual prospect of suffocation. Quinine, digitalis, squills, bryony, nitre, antimony, belladonna, &c., had been tried without success. A tablespoonful of lemon-juice was now given three times a day, which daily quantity was afterwards increased to six spoonfuls. This amount was taken for ten successive days; the doses were then diminished. In all, the patient had taken about three pints and a half of juice, by the aid of which be was entirely cured; at any rate, two years afterwards he remained one of the most active and best workmen of his class. No particular change of diet is mentioned; but Dr. Drechsler made his patient drink a glass of sugared water after every dose. Another case is that of a strong constitutioned man, 28 years of age, similarly cured in Dr. Drechsler's practice, after the failure of other means.—*Medicinische Zeitung.*

It will be recollected that this subject was alluded to in the last vol. of *The Lancet.* The action of lemon-juice on the kidneys is unequivocal. It is said, that if its employment be persisted in for a sufficient length of time, urine inevitably ceases to be albuminous.

DYSENTERY FROM ERGOT OF RYE.*

In the course of last year a great number af persons in the French department, *Loire-Inférieure* (Brittany), was attached with a species of dysentery after having eaten of damaged rye. The individuals were seized with vomitings of bilious matters mixed with blood; and the stools, which were at first mucous, became afterwards bilious and sanguinolent. The pulse was quiet and weak, and a generally adynamic condition ensued, under which the patient commonly succumbed about the tenth or twelfth day from the beginning of the attack. In one commune a practitioner gave his patients first a brisk emetic, and then a mixture composed of yellow cinchona bark, an ounce, and aqueous extract of opium, 4 grains, infused in a pint of boiling water for 24 hours, of which a table-spoonful was taken 3 times a day. A pill of camphor, opium, and quinine, was taken every night; poultices of marshmallows, emollient poultices to the abdomen, linseed enemata, and other palliative means, were used; and under such treatment 25 out of 27 patients recovered.

CAUSTIC PASTE OF SULPHATE OF COPPER.*

BY M. PAYAN.

A sufficient quantity of sulphate of copper is reduced to powder, and formed into a soft paste with yolk of egg.

This paste is spread on a small pledget of lint, or on a piece of linen or sparadrap, of the dimensions of the point to be cauterised. At the end of three or four hours, the caustic effect is produced. The shield is then removed, and there remains a scar which is not deep, and which shortly leaves only an imperceptible trace. M. Payan especially recommends this caustic for those parts of the skin which are habitually uncovered.

POISONING BY HEMLOCK AND BY CHERRY-LAUREL.†

A case occurred lately in France, in which hemlock eaten in a salad had made a number of persons ill, though the cook had, on a previous occasion, some days before, plucked a quantity of leaves from the identical plant of hemlock, mistaking it for chervil, and which, having been put into soup, were used without injury. In truth, hemlock is productive of no ill effect in soup, as its medicinal principle, coniine, is volatile, and, consequently, expelled by boiling. In 1809, when the French troops bivouacked before Madrid, a soldier cut down several branches of cherry-laurel for spits on which to roast meat. The bark having been unluckily stripped off, the juices of the wood penetrated the meat, and of 12 soldiers who ate of the latter, 7 died.

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* *The Lancet,* June 24, 1843.

* *L'Experience,* No. 289.

† *The Lancet,* June 24, 1843.

HOW TO MAKE LEECHES BITE.*

The leech which it is intended to apply is to be thrown into a saucer containing fresh beer, and is to be left there till it begins to be lively. When it has moved about in the vessel for a few moments, it is to be quickly taken out and applied. This method will rarely disappoint expectation; and even dull leeches, and those which have been used not long before, will do their duty. It will be seen with astonishment how quickly they bite.

SOLUTION OF ACONITE IN RHEUMATIC AFFECTIONS.†

BY DRS. RICHTER AND BASSE.

℞	Extract of aconite .	4	grammes.
	Antimonial acid . .	30	,,

From 30 to 40 drops every two hours. Dr. Busse raised, in one patient, the dose of aconite to 2 grammes 25 decigrammes without producing narcotism. This preparation is pointed out as useful in chronic rheumatic pains. According to Dr. Busse, this preparation is also very efficacious in dental pains of the same nature: his patients regard it as a true specific, and have given it the name of tooth-ache drops—*Gouttes contre les maux de dents.*

OLEO-CALCAREOUS LINIMENT.‡

BY M. PAYAN.

		Parts.
℞	Oil of sweet almonds . . .	1
	Lime water	2

If the presence of a little free lime water be desired, three parts of lime water may be put to one of oil.

In the treatment of burns of the first and second degrees in young children, this liniment appears promptly to relieve the pain, and to hasten cicatrisation. It is applied to the burnt part with a feather, or very soft hair pencil. After having put on a layer of it, it should be covered with lint. In general, the frictions should not be frequent; they must be repeated only at the expiration of seven or eight hours, and when it is perceived that the lint has imbibed pus.

GIACOMINI'S POMMADE.

℞	Fresh lard	15	parts.
	Cohobated hydrolate of cherry-laurel	4	,,
	Acetate of lead . . .	4	,,

M. and F. S. A. a perfectly homogeneous ointment.

This preparation, which has become popular in Italy, under the name of the Professor who has given its formula, is employed with the greatest success in external inflammations, and especially in chilblains. To apply it, a slight unction is performed on the surface of the inflamed, painful parts, or which are the seat of itchings.

In cases of prurigo, it is advantageous, according to the observations made by Dr. Cottereau, to add to the substances indicated for the composition of this pommade, 3 grammes of tar and 2 grammes of camphor.

IV. REVIEWS AND NOTICES OF BOOKS.

GLYPHOGRAPHY; *or Engraved Drawing, for Printing at the Type Press, after the manner of Woodcuts.* With full Directions for the use of Artists, Engravers, and Amateurs, and Specimen Illustrations. Second Edition. London: Palmer, Newgate-street. 1843.

PHOTOGRAPHIC MANIPULATION; *containing Simple and Practical Details of the most Improved Processes of Photographic Drawing, the Daguerreotype, and Calotype.* Illustrated with Cuts of the various Apparatus. London: Palmer, Newgate-street. 1843.

The first of these *brochures* is devoted to an illustrated description of Mr. Palmer's Patent Glyphography, or Engraved Drawing, which, we have no doubt, will shortly supersede even the best executed woodcuts. We candidly avow our unqualified admiration of the extreme beauty of the specimen illustrations with which this pamphlet is nearly filled, and we hope to see this system of illustration come into general adoption.

Now that illustrated periodicals are so much the rage, it may not be amiss for us to recommend the patent Glyphography to the notice of those connected with them: we feel convinced that it needs only to be known, to be appreciated.

It was our desire to have given our readers an opportunity of forming their own judgment of its merits, by furnishing a specimen illustration; and we sent to the patentee to request him to send us a block; but he declined doing so from the fear that an uninitiated printer might not do full justice to it. We are much disappointed at not having it in our power to do so, as we feel that our notice must be very imperfect without it.

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* *Schmidt's Jahrb.*

† *L'Experience*, No. 289.

‡ *Ibid.*

We extract, for the benefit of those who wish to be conversant with the process, the following description.

DESCRIPTION OF THE PROCESS.

A piece of ordinary copper-plate, such as is used for engraving, is stained *black* on one side, over which is spread a very thin layer of a *white* opaque composition, resembling white wax both in its nature and appearance: this done, the plate is ready for use.

In order to draw properly on these plates, various sorts of points are used (according to the directions here given), which remove, wherever they are passed, a portion of the white composition, whereby the blackened surface of the plate is exposed, forming a striking contrast with the surrounding white ground, so that the artist sees his effect at once.

The drawing being thus completed, is put into the hands of one who inspects it very minutely, to see that no part of the work has been damaged, or filled in with dirt or dust; from thence it passes into a third person's hands, by whom it is brought in contact with a substance having a chemical attraction or affinity for the remaining portions of the composition thereon; whereby they are heightened *ad libitum.* Thus, by a careful manipulation, the *lights* of the drawing become thickened all over the plate equally, and the main difficulty is at once overcome; a little more, however, remains to be done. The depth of these non-printing parts must be, in some degree, proportionate to their width; consequently, the larger breadths of *lights* require to be thickened on the plate to a much greater extent, in order to produce this depth. This part of the process is purely mechanical, and easily accomplished.

It is indispensably necessary that the printing surfaces of a block prepared for the press should project in such relief from the block itself, as shall prevent the possibility of the inking roller touching the interstices of the same, whilst passing over them; this is accomplished in wood engraving by cutting these intervening parts, which form the lights of the print, to a sufficient depth; but in glyphography the depth of these parts is formed by the remaining portions of the white composition on the plate, analogous to the thickness or height of which must be the depth upon the block, seeing that the latter is in fact (to simplify the matter) a *cast,* or *reverse,* of the former. But if this composition were spread on the plate as thick as required for this purpose, it would be impossible for the artist to put either close, fine, or free work thereon; consequently, the thinnest possible coating is put on the plate previously to the drawing being made, and the required thickness obtained ultimately as described.

The plate thus prepared is again carefully inspected through a powerful lens, and closely scrutinized, to see that it is ready for the next stage of the process, which is, to place it in a trough, and submit it to the action of a galvanic battery, by means of which copper* is deposited into the indentations thereof, and, continuing to fill them up, it gradually spreads itself all over the surface of the composition until a sufficiently thick plate of copper is obtained, which, on being separated, will be found to be a perfect cast of the drawing which forms the *clichée.*

Lastly, the metallic plate thus produced, is soldered to another piece of metal to strengthen it, and then mounted on a piece of wood to bring it to the height of the printer's type. This completes the process, and the glyphographic block is now ready for the press.

It should, however, have been stated, that if any parts of the block require to be *lowered,* it is to be done with the greatest facility by the process of mounting.

GENERAL RULES FOR DRAWING.

RULE I.—That every stroke, dot, or mark of any kind, made on the plate, with a view to its ultimate appearance on paper, must be made *quite through* the white *ground,* so that the blackened surface of the copper be distinctly seen through a glass, or with the naked eye; although if, peradventure, the black be removed also, and the bright metal appear, the drawing will in no way be deteriorated thereby; but the artist should observe that all such parts will print as dark as though the *black* were not removed.

RULE II.—Every stroke, &c. must be perpendicularly cut out; or in other words, it must not be *under worked,* so as to leave the edges of the lines projecting over the work. Also, that every particle of the *ground,* displaced by the point, &c., must be entirely removed from the edges of the work, and likewise from the plate itself.

RULE III.—It must ever be borne in mind, that since the *ground* in its nature resembles wax, as has been already noticed, it follows that it is very easily affected by change of temperature; so that, while on the one hand it would become clammy and clog the point on exposure to a high temperature, it would in the other be rendered brittle and liable to crack off from the plate by a great reduction of the same. The two extremes of temperature should therefore, at all times, be guarded against, and a medium temperature (say 65° Fahr.), as far as practicable, maintained; but whether or no, when about to be used, the artist would do well to submit it to a severe test, by putting a little close cross-hatching on the edge, to see if it chips off; if not, he may proceed with safety, otherwise it is necessary to apply a very moderate degree of heat to its back, but not sufficient to make the ground clammy. And *vice versâ*, in the height of summer, it may sometimes be useful to chill the plate, by the application of cold water, air, &c., to the back.

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* Vide *Smee on Electro-Metallurgy.*

The second work to which we have to call the attention of our readers, gives us no trifling amount of gratification. From the earliest period of the existence of "The Chemist," its pages have teemed with articles on the Daguerreotype. We brought it, in its at first imperfect state, under the notice of our readers, and have carefully watched its progress, and supplied all the new discoveries on the subject within the period of publication; and we now find it in comparative perfection, or at least at such a stage of progression towards that point, as to call forth universal admiration towards those who have labored in this beautiful, this fruitful field.

It is much to be lamented, that our Government did not follow the example of the French Government, and take steps towards throwing the subject open for the public good, instead of allowing a patent to be taken out for it; had they done so, England would have been able to boast more laborers in the field.

To those who do, and to those who may, study the Daguerreotype, we recommend the little work before us; it will be found to smooth their path, and to supply many a useful hint, as it is a practical work, and evidently written by a man well versed in the subject; and as the cultivation of this beautiful art has now become so extended, we prophesy for this treatise very extensive patronage; and to those who would study this subject as an occupation for their hours of leisure, we venture to affirm that they will not be able to find an enjoyment which may be practised at so trifling a cost, or from which more real pleasure may be derived.

As the author of this little work, in his preface, requests the leniency of his reviewers to be extended towards his first literary attempt, we will merely suggest the propriety of one or two little alterations in any future edition he may publish. He says, "the chloride of silver which is the result of the preparation of the paper is very soluble in hyposulphite of soda, whereas the oxide of silver reduced by the light is not." Now the action of light on the chloride of silver is to convert it into a subchloride, and not into an oxide, as Mr. Reuben Phillips demonstrated.* Again, there are more approved methods of iodising the silver plates, than described in this work; and the best method of silvering them is by means of electricity, and not by the plan which he gives. But notwithstanding these trifling defects, we think that this work is likely to run a course of usefulness, and we recommend it to the notice of our readers.

SCIENTIFIC TEETOTALISM. *Appendices to the Illustrated History of Alcohol. Exhibiting a View of the Accordance of Teetotalism with Recent Discoveries in Organic Chemistry, and Explaining the Modus Operandi of Alcohol; Firstly, on the Function of Respiration, and Secondly, on the Formation of Fat.* By Dr. Frederic Richard Lees.

The subject of total abstinence is certainly deserving of greater attention, in a physiological point of view, than it has hitherto met with. Considering the immense amount of spirituous liquors annually consumed in this country, it cannot but be important to ascertain the effect of this powerful stimulant on the human economy.

Having received Dr. Lees' work considerably after the 10th instant, and, consequently not having had time to consider its contents so fully as we could desire, we are constrained to postpone a more complete notice of the opinions it contains until next month, when we hope to have much to say on the subject.

In the meantime we recommend the work to our readers who are not teetotallers; those who are, stand not in need of it; the whole want not a physician.

LITERARY INTELLIGENCE.

We have much pleasure in informing our readers that a quarterly publication, entitled the Electrical Magazine, conducted by Mr. Charles V. Walker, will be published on the 1st of July, by Messrs. Simpkin and Co.

We understand that this Journal will be exclusively devoted to Electricity, "and will contain translations of foreign papers,—original contributions from our own electricians,—reports of lectures on new subjects, and of papers read before scientific bodies,

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* *See* The Chemist, Vol. III., p. 199.

—reviews of electrical books,—notices of new facts, new apparatus, experiments, &c."

We are quite convinced that it will be most ably edited by the talented gentleman above mentioned, and that it will tend to augment his already high scientific reputation.

BOOKS RECEIVED.

A TREATISE ON FOOD AND DIET: with Observations on the Dietetical Regimen suited for the Disordered States of the Digestive Organs; and an Account of the Dietaries of some of the principal Metropolitan and other Establishments for Paupers, Lunatics, Criminals, Children, the Sick, &c. By JONATHAN PEREIRA M.D., F.R.S. and L.S., &c. &c.

PHOTOGENIC MANIPULATION: Containing Plain Instructions in the Theory and Practice of the Arts of Photography, Calotype, Cyanotype, Ferrotype, Chrysotype, Authotype, Daguerrotype, Thermography. By GEORGE THOMAS FISHER, Jun. Illustrated by Woodcuts. London: G. Knight and Sons, Foster Lane, Cheapside.

TO CORRESPONDENTS.

"T. C. B."—There is no work on Mineralogy connected with the Collection in the British Museum. There is some notice of the minerals in the Synopsis, but not sufficient for study.

"A CONSTANT READER."—Send us the means of writing to you.

"G. M. R.," who writes about Sea Sickness, shall hear from us.

LETTERS received from Dr. N; G. B.; Several Associates of the Pharmaceutical Society; An Early Subscriber; R. S. L.; An Agriculturist; F. R. S.; A Manufacturer; One interested in Mines, &c. &c.

Those numerous Correspondents, who have communicated to us their intentions relative to the Pharmaceutical Society, have our thanks.

To SUIT the convenience of such of our readers as may wish for answers to questions sooner than can be obtained through the "NOTICES" in our Journal, we have determined on the following. Letters sent *before* the 10th of each month will be answered on that day by private letter; those which are sent after that time, on the 20th; after the 20th, letters will be answered in the Monthly No., or privately, on the 1st. Correspondents must send us their names and addresses; or initials, and the post-offices of their districts, will do. As this arrangement is for the benefit of our readers, postage stamps should be enclosed when private letters are requested in reply.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN MAY, 1843.

BY E. THOMPSON.

BAROMETER.

Monthly mean	29·67
Mean at 9 A.M.	29·66
Mean at 3 P.M.	29·70
Mean at 9 P.M.	29·67
Maximum on 1st	30·20
Minimum on 27th	29·29
Range	0·91

THERMOMETER.

Monthly mean	49°
Mean of maxima	59
Mean of minima	40
Maximum on 1st	70
Minimum on 6th	38
Range	32

WIND.

	Days.		Days.
N.	0	S.	2
N. E.	7	S. W.	2
E.	7	W.	6
S. E.	4	N. W.	1

RAIN.

4·60 inches.

WEATHER.

	Days.		Days.
Clear	5	Frost	0
Cloudy	3	Lunar halo	0
Overcast	0	Mist	3
Shower	13	Hail	0
Continued rain	8	Lightning	0
Snow	0	Thunder	1

GENERAL REMARKS.

This month has been remarkable for continued rain, attended with cold easterly winds, which have greatly obstructed the operations of the farmer and horticulturist. The quantity of rain fallen during the month has been more than 4½ inches.

NOTA BENE.—*All Communications, Books for Review, and Substances to be analysed, must be addressed "To the Editors of the Chemist, Care of Mr. Hastings, Publisher, 13, Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the 15th of each Month; Books for Review before the 10th.*

THE CHEMIST.

I. CHEMISTRY.

NOTICE OF SOME EXPERIMENTS ON SUBTERRANEAN ELECTRICITY, MADE IN PENNANCE MINE, NEAR FALMOUTH.*

BY R. W. FOX, ESQ.

READ BEFORE THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

I HAVE already communicated to the Geological Society of London, some results produced by the electric action of two nearly E. and W. metalliferous veins which have been partially explored in Pennance mine. I have since made other experiments in the same mine, in which ore-points, consisting of copper and iron pyrites in the two veins, were connected by a pair of copper wires, which, in most instances, acted on a galvanometer or other apparatus at the surface, an end of each wire having been brought up through a shaft for the purpose:—about 50 fathoms of wire were employed, although the ore-points in the different veins were only about 14 to 18 fathoms asunder in a direct line.

A galvanometer of not much sensibility was generally used; the needle, which was 2½ inches long, moved on a pivot, and had a coil of fine wire passed 48 times round it. Another galvanometer, consisting of a suspended astatic needle, and 140 coils of wire, was also employed occasionally.

When the former, which call No. 1, was placed in the circuit, the needle was deflected so as to become stationary at 14° to 15° from Zero; and it revolved rapidly round the circle when the circuit was broken and restored a few times, the direction of the electricity being from the south vein to the northern one. The other galvanometer (No. 2) suffered a permanent deflection of about 40°, when in the circuit. The interposition of a plate of platinum or zinc at either of the ore-points, or of a *point*, instead of a considerable surface of metal, did not affect the direction or force of the currents; they were, moreover, constant in both these respects during more than eight months that the two veins were connected by the wires, and a part of this time the mine was filled with water in consequence of an accident to the machinery. Ore-points in the two veins situated within two or three feet of the others respectively, were, at one time, connected by a second pair of copper wires of the same lengths as the first; both sets of parallel wires being kept apart, and insulated from the sides of the levels or galleries, by poles stretched across the latter at short intervals.

When galvanometer, No. 2, was placed in the second circuit, No. 1 remaining in the other, the needle of the latter receded at least 2°, standing at 12°, instead of 14° or 15°; and the former stood at 5° or 6° less than it did when only one circuit was established. On breaking either of the circuits, the deflection of the needle in the other circuit was increased to its original amount. And when *both* pairs of wires were connected with only *one* of the instruments, the effect was almost precisely the same as that produced by one pair alone,—not greater certainly.

A copper and zinc pair of plates of about 6 inches surface, separated by a piece of cotton cloth moistened with water, was placed in the circuit, and when the currents from this source and the veins *coincided* in direction, the needle of galvanometer, No. 1, stood at about 10°, that is, at less than it did when acted upon by the subterranean electricity alone; and when the deflection caused by the latter was afterwards opposed by the action of the plates, the needle went back to Zero, and even sometimes passed a little beyond it in the opposite direction. These anomalies may perhaps be referred to the low conducting power of the moistened cotton, which, small as its thickness was, very probably interrupted the transmission of the electricity more than the 14 or 18 fathoms of strata or "*Country*."

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* *Communicated to* THE CHEMIST.

On taking the voltaic elements from the circuit, and connecting them with the galvanometer, so as to form a separate circuit acting in an opposite direction to the electricity from the mine, the deflection showed a difference in favor of the latter, and indeed, this was the case when the interposed cloth was moistened by a very weak solution of common salt.

The electro-magnetic and decomposing effects of these subterranean currents also afforded unequivocal evidence of their energy. A helix of copper wire fixed round a small horseshoe-shaped bar of iron, was placed in the circuit formed by the wires from the veins, when the bar became so magnetized as to cause a compass needle $1\frac{1}{2}$ inch long, at the distance of nearly half an inch, to oscillate through an arc of about 70°, when the circuit was alternately made and broken a few times.

A solution of hydriodide of potash was found to have been decomposed after it had been left in the circuit for rather more than a day.

The endosmose action occurred in various experiments, but it may be sufficient to give one example. Sulphate of copper in solution was put into both branches of a U-shaped glass tube with clay in the bent part of it, the surface of the fluid in one branch standing half an inch above that in the other. A piece of silver wire was plunged into each of them, the upper end passing out through sealing wax, with which the extremities of the tube were stopped, and the apparatus was placed upright in the circuit, with the wire in the higher column of the fluid connected with the negative wire. In the course of a few days this column was found to have risen one eighth of an inch, the other having fallen in an equal degree, showing that the greater pressure of the higher column was superseded by the force of the electric action.

When small cylinders of copper pyrites were substituted for the silver wires in the branches of the bent tube, not only did the endosmose action occur, but the copper ore, forming the negative pole, had its surface gradually changed to vitreous copper in the course of two or three days,* the other ore-pole remaining unaltered. The same change was produced, and apparently with equal facility, when solutions of other salts, as carbonate of soda, or common salt, were substituted for that of sulphate of copper, in both branches of the tube. The cylinders of copper pyrites used in these experiments, were long enough for the upper ends to project above the mouths of the tube, where the opposite wires were attached to them respectively, and these were well coated with sealing-wax dissolved in alcohol, to prevent the access of moisture to any part of the metal; and, indeed, all but the lower portions of the ore were coated in like manner.

In some instances, the cylinders of copper pyrites were allowed to remain in solutions of sulphate of copper in the bent tube for several weeks, when deposits of oxide of iron were found coating the inside of the tube about the negative pole. These results remind one of the ochrey appearance observed in rocks inclosing much vitreous copper,—a fact noticed by my friend Joseph Carne; and it may be worth while to inquire how far the proportion of "*gossan*" in copper veins may be connected with the quantity of vitreous ore contained in them.

Since the foregoing experiments were made, I have obtained an electrotype copper plate $1\frac{1}{2}$ inch long, $1\frac{1}{4}$ wide, and $\frac{1}{30}$ of an inch thick, by the agency of these subterranean currents. The apparatus consisted of a porous earthenware vessel, resting on wooden legs in a larger one; both were partly filled with solutions of sulphate of copper, an engraved copper plate attached to the negative wire, being placed in the outer vessel, and another plate of copper attached to the positive wire, in the inner one. After a few days it was observed that crystals of copper had been formed on the negative plate, but it was nearly two months before the apparatus was removed from the circuit, when the deposited metal was detached from the plate, having received its impression, VI INSITA TERRÆ. Whilst this experiment was in progress at the surface, the water, as I have before mentioned, invaded the mine, but without interrupting the process; it appeared, indeed, that the electric action was rather increased than diminished by this circumstance.

Before the influx of the water, an ore-point in the north vein was connected with *rock* near the south vein (generally the wall of the vein,) and an ore-point in the south vein was likewise connected with *rock* near the north vein, in both which cases currents more or less feeble were detected passing towards the latter through the wires, which were insulated, as before, by wooden poles stretched at intervals across the galleries. It is probable that the moisture on the rocks conducted the electricity from the ore to the metal, however imperfectly; and when different metals, as platinum and zinc, were successively substituted for the copper in contact with the rocks, the currents were modified in their force according to the metal employed, but were seldom changed in their direction. The action was most decided when the place of contact with the rock was near ore; and sometimes the end of the wire, or rather the piece of copper attached to it, was rubbed by an assistant against the walls of one of the veins, or the sides of a "*cross-cut*" between them. Under these circumstances the astatic needle was several times suddenly much deflected; and the parts of the rocks from which this increased action proceeded, having been marked, they were broken away, when iron pyrites was in every instance found imbedded in them; and there can be no doubt that the smallest branch of copper or lead ore might have been detected in like manner.

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* Some of the ore thus changed was at the last Polytechnic Exhibition.

On several occasions the ends of the opposite wires were placed in contact with the rocks near the two veins, when there still appeared to be a tendency in the currents to pass in the same direction, but often they could not be detected, or were too feeble for their direction to be determined with certainty. Pieces of copper pyrites attached to the wires, and imbedded in wood, were likewise used instead of the metal, for producing contact with the rocks, and with still less effect; and when the contact was made with platinum and zinc in succession, the currents were in opposite directions, and in accordance with the action of those metals respectively; so that the existence of independent currents under the circumstances described, though more than probable, was not clearly proved. Electricity, generated by a pair of zinc and copper plates, was transmitted through the rocks between the two veins from N. to S., and also from S. to N., in order to detect any independent currents traversing the rocks by a *differential* effect on the needle. This method appeared likely to be a very delicate test of electric action in rocks, but no decided results were obtained, the currents passing in opposite directions apparently with equal facility, at least, the few experiments hitherto made in this way, have not led to any satisfactory conclusions relative to the point in question. It should be remarked, however, that the astatic needle employed, was inconveniently sensitive, and was often set in motion when the cause was not very obvious. With needle, No. 1, the case was widely different, as it could scarcely be moved by any subterranean currents that were not tolerably energetic, such as were produced when *both* the wires were in contact with *ore-points*, and then, as has been stated, it often revolved rapidly.

It has long been known that electric currents will traverse a very considerable thickness of rock or strata*, but in what degree this property may be modified by the nature or texture of the rocks, the saline contents of the subterranean water, or the proportion of ores included in the circuit, remains to be ascertained. If the influence of these different circumstances should greatly vary, electric currents generated by given elements might be rendered available on various occasions;—to ascertain, for instance, the connection of saline springs not very distant from each other, often appearing at the surface, or in mines; or of a metalliferous vein discovered in one place, with a vein which has been worked for ore in another. The conducting power of the circuit at Pennance mine, already described, was, in this way, found to equal that of a tolerably strong solution of common salt, the current in the latter experiment having to traverse an inch of the solution and short copper wires to complete the circuit. The conducting power of the rocks or strata in this case, therefore, appeared to be very great.

When some sulphate of copper was added to the solution, the conducting power of the latter exceeded that of the strata. Glass tubes filled with solution of salts in different known proportions, might be used as tests in experiments on the relative conducting power of different strata, and they might be referred to as standards in describing the results.

DISCUSSION OF SOME OBSERVATIONS BY M. PELOUZE ON THE SAME BODIES CONSIDERED IN THE AMORPHOUS AND CRYSTALLINE STATES.†

BY M. GAY-LUSSAC.

At the sitting of the Royal Academy of Sciences of the 9th of January last, M. Pelouze read a "*Memoir on Hypochlorous Acid, with some Observations on the same Bodies considered in the Amorphous and Crys-*

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* Many instances of this occur in my paper "On the Electro-magnetic Properties of Metalliferous Veins," published in 1830, in the *Phil. Transactions*, p. 399. I have long ago seen a *very feeble* current act on a sensitive galvanometer after it had traversed nearly a quarter of a mile of strata, and stronger currents would probably be detected in like manner, after having passed many times that distance under the surface.

† *Comptes Rendus*, No. 6, February 6, 1843.

talline States."* I fully join in the praises which the first part of M. Pelouze's Memoir merits; as to the second,—that containing some observations on the same bodies considered in the amorphous and crystalline states,—I request permission to make it the subject of discussion.

M. Pelouze has ascertained that oxide of mercury, precipitated from a mercurial solution, was violently attacked by chlorine, whilst the oxide obtained by the calcination of the nitrate or by the direct oxidation of mercury in the air, was acted on only after a long time, although it was in a state of extreme pulverisation. He is led to believe that this difference of action is due to two different states of the oxide of mercury. The precipitated, or amorphous oxide, would alone be susceptible of being decomposed by chlorine, at the ordinary or a low temperature, and the crystallised oxide would resist in the same circumstances. And the objection which would consist in the crystallised oxide of mercury, and especially its powder, giving with chlorine a small quantity of hypochlorous acid, does not appear sufficient to M. Pelouze for rejecting the preceding hypothesis; for this oxide might contain the amorphous modification. "I doubt," says he, "that the chemists who may repeat my experiments may attribute the differences which I have observed merely to a purely mechanical cause, as a greater number of reacting surfaces in the amorphous oxide. For my part, I should rather believe that pulverisation changes the nature of these surfaces, or sets at liberty small quantities of amorphous oxide concealed in the interior of the crystals."

M. Pelouze was confirmed in his opinion, by calling to mind that Wöhler had found considerable differences in the points of fusion of the same compounds, according as they were amorphous or crystallised. It appeared to him, *à priori*, possible that something similar might be manifested in the terms of the composition of oxide of mercury. Indeed, he found that the amorphous oxide on which chlorine exerts so energetic an action is decomposed by heat much sooner than the crystallised oxide. The difference is such, that if these two oxides be placed in the same alloy-bath, or, more conveniently, in the muffle of a cupel furnace, at a properly maintained temperature, the amorphous oxide completely disappears, while the other has scarcely begun to be decomposed.

"Thus, it is certain," continues M. Pelouze, "that the same compound, solely because it is amorphous or crystallised, ceases to manifest the same reactions on other bodies, and that it likewise presents great differences in the term of its decomposition by heat. That is the most active, if I may so express myself, which is soonest decomposed, and that is not peculiar to oxide of mercury. I have recognised the same property in the amorphous and crystallised binoxide of manganese, and in Iceland spar. The amorphous compound is decomposed before the same compound in crystals.

"I hope that the experiments which I have detailed in this Memoir are of a nature to attract the attention of chemists. They prove how important it is to establish a distinction, even in a purely chemical point of view, between bodies which differ only by a peculiar state of aggregation. It was known, indeed, that certain insoluble bodies obtained by precipitation were more adapted for certain reactions than the same bodies prepared by the dry way; but the differences of cohesion alone were seen, and they were not considered also to extensively modify the chemical properties."

The importance of the question raised by M. Pelouze has determined me to quote his own expressions nearly verbatim: I should have been fearful, in mutilating them too much, of altering the sense of his ideas. Now, it will be more easy for me to discuss them. I wished at first to verify M. Pelouze's experiments on the decomposition of amorphous and crystallised oxide of mercury by heat; for the disappearance of the amorphous oxide in the muffle of a cupel furnace, more speedily than that of the crystallised oxide, did not appear to me conclusive.

I therefore submitted to the action of heat in the same fusible alloy-bath, two glass tubes, of equal diameter, containing equal weights, the one of well crystallised oxide of mercury, made directly by the air, and the other of oxide precipitated from the chloride and well dried.* The gases were conducted in small eprouvettes on to a water-bath. The temperature was slowly raised, and, nevertheless, at the same moment, or very nearly so, the metallic mercury exhibited itself in very fine globules on the upper side of the tubes, and oxygen began to be disengaged. Every time that the fire was lowered, then revived, the disengagement of oxygen ceased, or was resumed simultaneously in both tubes, and these alternations were very frequently repeated, with the same result. Only the decomposition proceeded rather more rapidly with the amorphous than with the crystallised oxide. But this circumstance is easily explained; and it is sufficient, besides, that it be proved that, at the same temperature, the decomposition of both oxides is simultaneously manifested, stopped and resumed.

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* For which see THE CHEMIST, No. XLII. (VI. N. S.) page 241.

* M. Lariviere was kind enough to assist me in my experiments.

I have also submitted to the action of heat crystallised marble and carbonate of lime obtained by dissolving some of the same marble in hydrochloric acid, and afterwards precipitating by carbonate of soda. The two carbonates were placed in porcelain tubes, one touching the other, on the same furnace, the heat of which might be regulated at will. A disengagement of carbonic acid began to be manifested at the same time in both tubes, when the temperature was a dull-red heat; but it was scanty and very soon stopped. I attributed it to the action of the surface of the tubes on the carbonate of lime. At a higher temperature, towards cherry-red, the disengagement of carbonic acid was again manifested, and at the same time in both tubes. When the temperature was lowered by diminishing the current of air, the disengagement of carbonic acid almost immediately relaxed, then entirely stopped; a rapid absorption took place, and the water of the tub in which the gases were received would have rushed into the porcelain tubes, if safety tubes had not permitted the ingress of air. When the combustion was resuscitated by re-establishing the current of air, the disengagement of carbonic acid without delay resumed its course, and always simultaneously in both tubes. These variations of temperatures were produced several times, and were uniformly attended with the same results. I could not then explain to myself how it was that M. Pelouze has always seen the amorphous compound decomposed before the same compound in crystals, if our process were the same.* I will observe, for those who may repeat these experiments, that it is not the volume or the weight of the products which should be regarded, since *they* may depend, *ceteris paribus*, on the surfaces exposed to the action of heat, but indeed their simultaneous appearance, diminution or cessation. However, having operated on equal weights of each body, and having reduced the crystallised body to very fine powder,* I have not obtained great differences in the progress of the products, either as regards the oxide of mercury or the carbonate of lime.

It is assuredly the inaction of chlorine on crystallised oxide of mercury, and its energetic action on the precipitated oxide, which made M. Pelouze admit, in this combination, two modifications, which might have escaped until now, although sufficiently powerful to modify the affinities. I hasten to say that there exist numerous ones, which cannot be denied; but the more mysterious they are to us, as regards both their cause and their influence, the more circumspection ought we to use in making them intervene in chemical phenomena. For my part, the difference of the action of chlorine on the two oxides is not anomalous, and I will explain how I conceive it.

Imprimis, and M. Pelouze has himself recognised it, the action of chlorine on the amorphous and crystallised oxides is absolutely the same in water, which is and ought to be rather longer for the amorphous than for the crystallised oxide. Now, what part does this liquid perform in the experiment? I see in it nothing but a solvent; it removes the chloride of mercury as it is formed on the surface of the oxide, and keeps it always *clean*, always the same. It is the most favorable circumstance for the exercise of the chemical action between two bodies. By suppressing the intervention of water, the mode of action of chlorine on crystallised oxide of mercury is still the same; for chloride of mercury and chlorous acid are produced, although in very small quantity. M. Pelouze admits this; but he explains the result by saying that the crystallised oxide may contain the amorphous modification; and as regards the same oxide powdered, which produces rather more chlorous acid, that he believed that pulverisation changes the nature of the surfaces, or liberates small quantities of amorphous oxide concealed in the interior of the crystals. But this is a new supposition, grafted on a former supposition, and it will not be granted that one can give consistence to the other. It remains constant, on the contrary, that the action of chlorine on the two oxides of mercury is the same, since its products are identical, and that there is no other difference between them except the time they require to be completed. The apparent inertness of chlorine on crystallised oxide of mercury, may be perfectly compared to that of rather concentrated nitric acid on carbonate of baryta; if it be diluted with much water, and if the nitrate of baryta formed at the surface of the carbonate be dissolved, the action then becomes very vivid, as between chlorine and crystallised oxide of mercury in the presence of water. It is thus that potassium and sodium decompose water so rapidly only because their oxides are very soluble in it; that many metals, alone capable of decomposing water, but producing insoluble oxides, are but slowly oxidised; whilst, with the assistance of acids which dissolve their oxides, the decomposition of water is effected with great rapidity;* that eminently oxidisable bodies remain in presence of eminently oxidising agents without undergoing any perceptible alteration; that the combustion of carbon, the product of which is volatile, for that reason becomes so easy, while that of boron, a far more highly combustible body, is very difficult, and stops as soon as the surface of the boron becomes covered with the finest possible layer of boracic acid, &c.

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* I have since learned, from M. Pelouze himself, that he had appreciated the difference by heat of the oxide of mercury, of carbonate of lime, and of oxide of manganese, in the amorphous and crystallised states, not by the temperature at which the same body might have been decomposed in each of its states, but, indeed, by the quantities decomposed, in the same time, at the same temperature.

* The pulverisation of the crystallised oxide is permitted; for M. Pelouze, in reply to a question asked by M. Thénard at the sitting of the 9th of January, as to whether he had operated on Iceland spar in crystals, stated that he took care to employ it in very fine powder, the same as the crystallised oxide of mercury.

But it will be asked, why is the precipitated or amorphous oxide of mercury so easily attacked by chlorine, without the intervention of water? Why does not the chloride of mercury which must equally be formed on its surface, prevent the chemical action from being propagated? I think the reply easy.

I will first call to mind, according to the observation of M. Pelouze, that the amorphous oxide, precipitated from a mercurial solution and dried at the ordinary temperature, gives, with chlorine, no other gaseous product than chlorous acid, when it is done in such a way that no elevation of temperature can take place. If the oxide be thrown into dry chlorine at a common temperature, a vivid disengagement of heat and light is manifested, and there is no other gaseous product than oxygen. By cooling the chlorine in a frigorific mixture, the oxygen is replaced by chlorous acid; the same result is obtained by putting in contact with chlorine amorphous oxide previously heated to a temperature of 540° to 710° Fahr.; the oxide, contracted by heat, is more slowly attacked by chlorine, and the temperature is so much the less raised.

By operating at a common temperature with amorphous oxide which has not been calcined, it is easy to obtain constantly chlorous acid without oxygen, by mixing it, before introducing it into chlorine, with a certain quantity of sand or sulphate of potassa reduced to powder. The heat disengaged is moderated by this mixture, and the action between the two bodies is propagated so much the more slowly as the proportion of inert matter is more considerable. With that of about one third of the volume of oxide which I employed, in my few experiments on gaseous chlorous acid, I constantly obtained a gas very easily absorbable by water without any perceptible residue, although the mixture was not very intimate.

Thus the products of the action of chlorine on the amorphous oxide of mercury, depend on the temperature at which they are formed; but this action is finally accomplished; it may be moderated, but not entirely suspended. It is because the precipitated oxide is in a state of division which may be called molecular, and because the chlorine finishes by penetrating into its whole mass.

It is not the same with crystallised oxide of mercury. It is in small compact masses, which mechanical division cannot reduce to the same degree of tenuity as the precipitated oxide. These combined circumstances easily explain why the action stops almost as soon as it has commenced. The chloride of mercury remains fixed on the surface of the oxide, and however fine the layer may be, it is sufficient to prevent all contact between the oxide and the chlorine, and to totally suspend their action. Chlorous acid is produced, and proportionally to the quantity and division of the oxide, although always in small proportion; but that is sufficient to demonstrate that the action of chlorine on the crystallised oxide is absolutely of the same nature as that which it exerts on the amorphous oxide, and that there is no difference except in the proportion of the products. If the chloride of mercury were dissolved by means of water, or volatilised or only separated by heat, the results would immediately be the same.

There can therefore be seen in the difference of the action of chlorine on the two oxides of mercury, only the result of a purely mechanical cause, and not that of undetermined modifications. I think that the affinities are more energetic, more profound, and could not be the sport of properties so hypothetical, so undefinable. One of the most remarkable modifications which can be mentioned is undoubtedly that which the carbon in the form of the diamond presents to us; it is evident and palpable, and it would be difficult for the same nature of body to find more different physical properties. And still the proper affinities of the chemical substance of carbon and the diamond remain the same in this disorder of modifications. MM. Dumas and Stas found the diamond to burn in oxygen more easily than anthracite, and as well as ordinary carbon; and it has long been known that there is not an experiment with carbon which does not generally give the same result as with the diamond.

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* It is worthy of remark that no metal which does not decompose water *alone*, decomposes it in the presence of the acids.

In speaking of modifications, two things have to be considered,—the existence of the modification and its importance in chemical phenomena. Now, if we may judge of this last by the example of the diamond, and by others which might be mentioned, we shall be convinced that this importance is not so great as might at first be supposed, and that physical properties always remain effects of chemical, and cannot profoundly modify them.

In indulging in these observations, it is not with the view of diverting attention from modifications which may be manifested in bodies, but only to guard against the existence which one is sometimes too easily disposed to accord to them; and against the false applications which are made of them, or the importance which is attributed to them. I will mention an example:—

Sulphur, exposed to an increasing heat, presents various appearances which are not ordinary, and which modifications have qualified. Frankenheim distinguished three of them, which he designated by the symbols, $S\alpha$, $S\beta$, $S\gamma$.

The first modification, $S\alpha$, is sulphur at the moment of fusion, which, according to Frankenheim, takes place at 240° F.; it is then transparent and almost colorless. It is this modification which gives the crystallisation in octohedrons, when sulphur is separated from a solvent.

The second modification, $S\beta$, is formed above the fusion of sulphur, and lasts to the temperature of 482° to 500° F.; the sulphur is no longer translucid, and its color has become of a deep brown. To this modification belongs the prismatic crystallisation of sulphur obtained by fusion.

Finally, the third modification commences at the temperature of 482° to 500° F., it is then brown, and almost solid. Heated beyond this temperature, it again becomes fluid, appears almost black, and boils at 782° F; we then have fused $S\gamma$, almost as liquid as water. Between the temperatures of 482° and 500° F., the thermometer remains for some time stationary, in either its ascent or descent.

As sulphur may be evaporated and sublimed below 482° F., it is considered evident that the three isomeric modifications of sulphur have each their gas, and that the deep yellow gas, which weighs three times more than the gas of sulphur should weigh according to calculation, is $S\gamma$, and not $S\alpha$, which, probably, is the modification of sulphur which enters into our ordinary sulphurets.

Berzelius, after having given an account of the ideas of Frankenheim, adds:—"We are now, therefore, in a situation to understand the error committed by calculating the atomic weight of sulphur according to the weight of $S\gamma$ which experiment gives, and that the true weight of the gas of the sulphur, calculated by means of that of sulphuretted hydrogen, and sulphurous acid, alone is accurate; it is also that which accords with the atomic weight of sulphur. We find, besides, that this difference between the two iron pyrites, which so much embarrassed the crystallographer, Haüy, must arise from one of them containing $S\alpha$, and the other $S\beta$, although we cannot say which of the two modifications belongs to one or other of these pyrites." *

I know not whether we are convinced of the existence of the three modifications of sulphur, and of the part attributed to them; for my part, I find that modifications based on shades of color, on a little more or a little less transparency or consistence, are very vaguely defined, and that their supposed connection with the changes of density in the vapor of sulphur, as well as their existence in the isomeric pyrites, rest on very shallow data. These modifications, and the consequences which may be drawn from them, although supported by the assent of the greatest master of the science, can be considered only as hypothetical conjectures, touching too near the occult sciences. They would, besides, be of very sterile application, since they would leave unexplained the same anomalies, with regard to the density of the vapors of arsenic and of phosphorus, as that which sulphur presents.

M. Pelouze has given, in his Memoir, a table of the solubility of chlorine in water at different temperatures. He has remarked that solubility attained its maximum between 9 and 10 degrees, and that it was also at this same temperature that the hydrate of chlorine was destroyed. Taking the volume of water as unity, Mr. Pelouze found that

it took	vol.		vol.
at 0° . . .	1·75	to	1·80
9 . . .	2·70	,,	2·75
10 . . .	2·70	,,	2·75
12 . . .	2·50	,,	2·60
14 . . .	2·45	,,	2·50

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* Berzelius' *Annual Report*, 1840, p. 5.

	vol.		vol.
at 30° . . .	2·00	,,	2·10
40 . . .	1·55	,,	1·61
50 . . .	1·15	,,	1·20
70 . . .	0·60	,,	0·65

I am occupied with precisely the same subject in my Memoir on Cohesion ; but proposing to treat in particular of the solubility of some gases, I have quoted for that of chlorine only the maximum which it presents at the temperature of about 46° F. The following are the results which I find in my notes. One volume of water takes at

	vol.	
0°	1·43	of chlorine supposed to be measured at 32° F., and $0^{\text{m}}\cdot76$.
3	1·52	
6·5	2·08	
7	2·17	
8·6	3·04	
10	3·00	
17	2·37	
35	1·61	
50	1·19	
70	0·71	
100	0·15	

I will return to this solubility of chlorine, which is only the apparent, and not the real solubility. The latter is obtained by multiplying the first by $\frac{P}{f}$; P being the atmospheric pressure, and f the elastic force of the aqueous vapor corresponding to each temperature. Thus the apparent solubility of chlorine at 70 degrees being $0^{\text{vol}}\cdot71$, the true solubility would be

$$0^{\text{vol}}\cdot71 \times \frac{0^{\text{m}}\cdot7600}{0^{\text{m}}\cdot2291} = 2^{\text{vol}}\cdot355.$$

This observation applies to the solubility of all the elastic fluids.

M. Dumas added, on this subject, some details concerning experiments which M. Jacquelain proposes to address to the Academy. He has seen, in fact, conformably to M. Gay-Lussac's opinion, that red oxide of mercury, crystallised and powdered with care, acts, with regard to chlorine, exactly like the oxide of mercury obtained by precipitation.

CONSIDERATIONS CONCERNING THE SPECIFIC GRAVITY OF METALS.*

BY PROFESSOR MAGONTY, OF BORDEAUX.

When we seek in books for the specific gravity of a metal, we are very often embarrassed. We find numbers differing to a greater or less extent, to indicate the density of the same substance. It is thus, for example, that the density of platinum was estimated by Wollaston at 21·53, by Berzelius at 21·45, and by Klaproth at 21·74. As regards silver, we are undecided between the numbers 10·474 and 10·542. It is the same with many metals.

Material obstacles are, I believe, the cause of these anomalies. Let us, indeed, take one metal ; how many causes may modify its density ! If it belong to the class regarded as infusible, its estimation will then be only approximative, and different numbers will be obtained according to the state of aggregation to which it may be brought. If the metal be capable of entering into fusion, it is evident that the manner in which it cools must modify its specific gravity, and that this modification will vary with each of them. Thus, the easily crystallisable metals must undergo much greater variation than those whose texture is more amorphous. The symmetrical arrangement of the molecules in one case, and their confused mixture in another, are material causes of infinite variations.

These theoretical considerations, nevertheless, required the sanction of direct experiments. The following are some of the facts to which my investigations have led me.

Some zinc of commerce, the purity of which I am far from being able to guarantee, had a specific gravity of 6·757. I fused it in a crucible, and I threw it in small portions, 1st, on the ground ; 2nd, in water at + 57° F. ; 3rd, in water at 32° F. Again, I heated some of it to redness, and cooled it : 1st, in water at 57° F. ; 2nd, in water at 32° F. ; 3rd, in the crucible surrounded with charcoal.

The density varied as follows for each of the samples :—

Zinc of commerce (in large plates)		. . . .	6·757
,,	fused and poured on the ground	. . .	7·129
,,	,,	into water at 57° F. . . .	7·121
,,	,,	into water at 32° F. . . .	7·077
,,	fused to red heat and poured into water at 57° F.		7·041
,,	,,	into water at 32° F. . . .	7·061
,,	,,	and cooled slowly . .	6·928

Bismuth gave the following results :—

Bismuth of commerce (sample taken from a large mass)	. .	9·595
,, fused and poured on the ground	. . .	9·925

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* *Actes de L'Académie Royale de Bordeaux*, 2e Trimestre, 1842.

With *lead*, I arrived at the following numbers:—

Pig lead of commerce	11·295
,, fused and poured on the ground	11·341
,, fused and cooled in the crucible	11·288

Antimony, being so easily crystallisable, ought to present still greater variations:—

Antimony of commerce	6·605
,, fused and poured into oil (lenticular fragments)	6·854
,, pisiform fragments	6·284

With *tin*, I obtained:—

Tin cooled and fused in the crucible	7·272
,, poured on the ground	7·335

The results evidently demonstrate the general principle which I had advanced, namely: that the mode of cooling has much influence on the specific gravity. By bringing together the facts obtained, we have the following table:—

Tempered metal	7·129	9·725	6·854	7·335	11·340
Metal of commerce	6·757	9·595	6·605	7·272	11·295
Difference	0·372	0·330	0·249	0·063	0·045

If we may be permitted to draw a general induction from the uniformity of these results, we may say:—1st, that solidification increases or diminishes the density of metals: 2nd, that the easily crystallisable metals (zinc, bismuth, and antimony,) are more dense in the state of fusion than in the solid state, when cooling has permitted a regular crystallisation. Their molecules are then at a greater distance from each other, like those of frozen water.

To the causes of error which I have just noticed, in the determination of specific gravities, I should also add, the variable temperature at which the metal has been fused; for, *ceteris paribus*, cooling, which we know to have a great influence on density, will be so much the more regular as the temperature has been higher, and as the metal will require a longer time to solidify; that thus, the more the point of fusion has been exceeded, the more will the crystalline or contractile force be increased.

It has long been known that a metallic body has a different density, according as it has been *hardened*, *forged*, *laminated*, or *drawn out in wire*.

Fused zinc, for example, weighs specifically	6·861
The same metal forged	7·215
Bar iron weighs	7·844
Thin iron plate	7·60
Iron wire	7·50

Finally, the impurity of metals sometimes diminishes the little security we can have in the numbers assigned to specific gravities. It is very difficult indeed, to obtain metals perfectly pure. If they be reduced by black flux, an alloy of potassium is to be feared; by charcoal, a carburet, &c.

The preceding considerations sufficiently explain to us the numerous variations to which the estimations of densities have given rise, and it appears to me that we ought to be surprised at not finding more considerable differences. Comparable results as regards all the metals, and identical for each of them, would doubtless be desirable; but in order to obtain them, it would be necessary to combine so many impossible conditions, that it appears to me impossible for such a desire to be realised by our physical means. Indeed the metals would require to be equally fusible, equally crystallisable, equally heated, equally cooled, equally pure, &c.; and it is known, that it cannot be thus.

In the face of these *material* obstacles, we should therefore avow that the numbers given in the tables are only approximations, and that we have not the means of controlling their value. But if physical science is unable to attain this point, cannot it call in Chemistry to its aid? Are not these two sciences destined to afford mutual support to each other? and do not they form a whole, like two chapters of the same book?

Gay-Lussac has already remarked that the most dense metals also have the highest atomic weight. Dumas afterwards made known the curious relations which exist, as regards certain groups, between the specific gravity and the atomic weights. I have endeavored, in my turn, to investigate the relation which might exist between the densities and the chemical equivalents.

The following table indicates the results at which I have arrived:—

The first column is devoted to the names of the metals; the second gives the density of each of them; the third, the chemical equivalent; the fourth, the quotient obtained by dividing the density by the equivalent; the fifth, the simple, or fractional multiple, which raises the proportion to a number almost similar, contained in the sixth column.

Names of Metals.	Densities.	Equivalents.	Relations.	Modifications.	Products.
Gold . .	19·65	2486·02	0·0078	2	0·015—6
Osmium[1] . .	10 ?	1244·48	0·0080	2	0·016
Iridium[2] . .	19 ?	1233·50	0·016	,,	0·016
Platinum[3] . .	19·50	1233·50	0·0158	,,	0·015—8
	21·50		0·0170	,,	0·017
Palladium . .	11·30	655·90	0·017	,,	0·017
Rhodium . .	11·20	651·38	0.017	,,	0·017
Silver . .	10·61	1351·61	0·0078	2	0·015—6
Mercury[4] . .	13·535	2531·64	0·0053	3	0·015—9
Copper . .	8·788	791·39	0·0111	$\frac{3}{2}$	0·016
Uranium[5] . .	9 ?	2711·36	0·033	5	0.016
Bismuth . .	9·88	886·92	0·011	$\frac{3}{2}$	0·016
Tin . .	7·30	735·29	0·0099	$\frac{3}{2}$	0·014—9
Lead[6] . .	11·352	1294·50	0·0087	2	0·017
Cadmium . .	8·6	696·77	0·0123	$\frac{4}{3}$	0·016
Zinc . .	6·862	403·23	0·017	,,	0·017
Nickel[7] . .	8·666	369·67	0·023	$\frac{2}{3}$	0·015
Cobalt[8] . .	8·53	368·99	0·023	$\frac{2}{3}$	0·015
Iron[9] . .	7·843	339·21	0·023	$\frac{2}{3}$	0·015
Manganese[10] .	8·013	345·89	0·023	$\frac{2}{3}$	0·015
Sodium . .	0·972	290·92	0·0033	5	0·016
Potassium .	0·865	489·92	0·0017	10	0·017
Antimony . .	6·70	1612·90	0·0040	4	0·016
Tungsten[11] .	17·6	1183·00	0·0148	,,	0·014—8
Molybdenum[12] .	8·63 ?	598·52	0·0144	,,	0·014—4
Tellurium . .	6·244	801·74	0·0077	2	0·015
Titanium[13] .	5·30 ?	303·66	0·017	,,	0·017
Chromium[14] .	5·90	351·32	0·017	,,	0·017

1. The density of osmium is still hypothetical; nevertheless, the result obtained, modified by 2, enters into the general law.

2. It is the same with iridium, whose result does not want modification.

3. The density of platinum varies much, either by lamination, or by fusion before the oxyhydrogen blowpipe.

4. The numbers assigned for the density of mercury vary between 13·535, and 13·643. This last number corresponds to a relation which, modified by 3, gives 0·016.

5. M. Péligot has announced that uranium is an oxide. Its proportional number will, therefore, be changed, as well as its density.

6. Lead enters into the group of gold and silver.

7, 8, 9, 10. Cobalt, nickel, iron and manganese, present a relation which had already been remarked, but whose ratio, modified by $\frac{2}{3}$, gives a number equal to the common proportion.

11, 12, 13, 14. The great difficulty of fusing these four metals induces me to believe, that their density is only approximative.

According to this table, it is evident that by dividing the density of a metal by its chemical equivalent, a ratio is obtained nearly identical for all the metals, or a multiple by a very simple entire number of this common ratio. If this ratio differs a little, let us not lose sight of the circumstance that one of the terms of the proportion (the density) is only an approximation, and that a greater or less difference in this term will necessarily cause the quotient to vary. If we had put in this table, as regards each metal, all the numbers assigned to its specific gravity, we should have found great variations in the ratio; we must not, therefore, be astonished at finding different ones for the bodies which we have examined.

It seems to me that we cannot help admitting a great analogy between the numbers found, and that thence, there should exist a relation between the equivalents and the densities of metals.

By neglecting the *modifiers* for a moment, and by paying attention only to the relation, we may say that the densities are proportionable to the equivalents; and calling these densities D and D′, and their equivalents E and E′, we shall have the following proportion:—

$$D : D' :: E : E'$$

Whence we deduce $D = \frac{D'E}{E'}$

This expression, *modified* by the special number for each metal, will give the density sought. For that purpose, it would be necessary to know D′, that is to say the density of a metal which would serve for determining the densities sought. But what metal shall we select for a type? Which is that whose density will present to us sufficient guarantee that, by its aid, we may be able to modify all the others?

Mercury is, I think, that which should be preferred. Its state of liquidity, which does not allow of the existence of small vacuities in the interior of the mass, and its well known dilatability, by aid of which its volume may easily be brought to 32° F., justify the selection. As regards the other metals, we can have only approximations, which deviate, more or less, from the true number, according to the circumstances in which we are placed. Mercury appears to me to combine the most favorable conditions for the estimation of its specific gravity, and, as should be expected, the ratio is nearly the mean of all the others. This ratio, modified by 3, is 0·016, and the general formula will become:—

$$D = \frac{D'E}{E'}$$

instead of

$$D = 0{\cdot}016E.$$

The last term of this formula will be modified, by the particular modifier which we will call A, and we shall have:—

$$D = \frac{0{\cdot}016E}{A}$$

Thus, and to sum up, I may conclude:—

1. That the numbers assigned to the specific gravities of metals are only approximations.
2. That the physical means, by aid of which they are obtained, are insufficient, for it is necessary that all the metals be equally fusible, equally crystallisable, equally pure, &c., which is materially impossible.
3. That cooling has much influence on the density of metals.
4. That there exists a relation between the specific gravity and the proportional number, or chemical equivalent, that is to say, that the most dense metals are those whose proportional number is highest, and when this ratio differs, it is by a very simple multiple number, or an equally very simple fraction.
5. That by adopting the density of mercury as a type of exactitude, a general formula may be arrived at, by aid of which, the specific gravity of each may be determined.

ANALYSIS OF THE OXYGENOUS COMPOUNDS OF SULPHUR.*

BY MM. J. FORDOS AND A. GELIS.

The analysis of mixtures of the oxygenous compounds of sulphur presents the greatest difficulties in the present state of the science. The chemist is as yet able to recognise and estimate them only when they are mixed two and two; but the known processes are quite insufficient when they exist in greater number in the same liquor. Recent discoveries, having increased the number of these compounds to six, have rendered the difficulties still greater; but at the same time they have attracted attention to some properties of these bodies which are of the greatest importance in an analytical point of view.

Thus the different action which chlorine and iodine exert on these acids, has enabled us accurately to estimate solutions containing five of these compounds. Although most of these differences of action are known to chemists, as they serve as the basis of the analytical method which we are about to describe, we think it useful to recapitulate them here.

Chlorine and iodine have no action on sulphuric and hydrosulphuric acids; on the contrary, they rapidly convert sulphurous acid into sulphuric acid; the water is decomposed, and for each equivalent of sulphuric acid formed, an equivalent of chlorine or iodine is absorbed, and an equivalent of hydrochloric or hydriodic acid is produced.

Chlorine and iodine are far from acting in the same manner on the other three acids of sulphur, and we must here enter into some details.

When a current of chlorine is driven into a dissolved hyposulphite, the phenomena are different according to the state of concentration of the liquors: in a concentrated solution the reaction is very complicated; independently of the sulphur, sulphurous acid, and sulphuric acid, a yellow liquid is produced, which flows at the bottom of the vessel, and possesses all the characters of chloride of sulphur. In a dilute liquor, this last product is not formed; but, however dilute it may be, it always precipitates sulphur at the same time that it disengages sulphurous acid.

The chlorine, on being dissolved in a dilute solution of M. Langlois' salt, or of a bisulphuretted hyposulphate, easily converts all the sulphur into sulphuric acid; but the quantity of water must be very considerable, for a concentrated solution would give also chloride of sulphur.

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* *Comptes Rendus*, No. 19, May 15, 1843.

Iodine is without action on the hyposulphates and the sulphurets; the mode in which it acts on the hyposulphites, is, on the contrary, remarkable. We have shown that one equivalent of salt absorbs exactly half an equivalent of iodine without producing either sulphurous acid, sulphuric acid, or a deposit of sulphur, and that the result of this reaction is an iodide and a bisulphuretted hyposulphate.

These facts established, it is easy to apply them, either to the analysis of mixtures, or to that of isolated compounds.

Let us suppose a very complicated mixture, containing a sulphate, a sulphite, a hyposulphite, a hyposulphate, and a bysulphuretted hyposulphate. The following is the way in which we should operate:—

The liquor should be divided into four equal portions.

First Portion.—The first will serve for the estimation of the sulphuric acid; for that purpose, it is mixed with a solution of chloride of barium in excess; the precipitate is received on a filter and washed on the same filter,* first with boiling distilled water, then with water acidulated with hydrochloric acid; it is then dried, collected, and weighed.

Second Portion.—The second is treated by iodine; but it must previously be mixed with a few grammes (the gramme is about 15½ grains) of carbonate of magnesia, for without that the analysis would be impossible. In fact, the liquor contains a sulphite; by taking oxygen from the water, the sulphite becomes a sulphate, but at the same time hydriodic acid is formed; if this acid did not find, at the moment of its formation, a base to saturate it, it would react on the intact portion of sulphite, or on the hyposulphite which the liquor likewise contains, and there would be a loss of sulphurous acid and a deposition of sulphur. The carbonate of magnesia remedies all these inconveniences; it does not absorb iodine itself, and the acids decompose it more promptly than the sulphites.

The liquor, with this addition, is then treated by iodine; when it is saturated, the weight of iodine employed must be carefully noted; the quantity of sulphuric acid contained in the liquor must then be determined, *de novo*, by means of chloride of barium. The weight of sulphur employed will be greater than in the first experiment; the increase of weight serves to determine the quantity of sulphurous acid, and the weight of the iodine necessary for converting it into sulphuric acid.

When arrived at this point, it is easy, without resorting to other experiments, and by simple subtraction to procure all the elements necessary for the determination of the quantity of hyposulphurous acid. From the total weight of the iodine employed, subtract that quantity which converts the sulphurous into sulphuric acid; the difference is absorbed by the hyposulphurous acid. Now, it is known that 2 equivalents of this acid absorb 1 equivalent of iodine.

In order to treat the liquor by iodine, we use, as in the sulphohydrometer, an alcoholic solution of known strength, or else we gradually add to the liquor small fragments of iodine taken from a bottle whose weight has been previously determined. Solution is rapidly effected, and it is easy to seize the point of saturation. It must be stopped as soon as the liquid assumes a yellow color. The change of color is very striking, and it is quite needless to add to the liquor starch or any other foreign body.

Third Portion.—This portion of the liquor serves for the estimation of the bisulphuretted hyposulphuric acid; it is treated by iodine,—taking the same precautions as in the preceding portion,—to saturation, but there is no necessity for taking account of the weight of the reagent employed. The iodine forms, as we have said, a sulphate at the expense of the sulphite, and a bisulphuretted hyposulphate at the expense of the hyposulphite; this quantity is added to that already contained in the liquor. This done, about 100 parts of water are added to the saline solution to be analysed, and it is treated by a current of chlorine. The sulphated gas will be all the sulphur of the bisulphuretted hyposulphate, without touching that of the ordinary hyposulphate. When the saturation is complete, the liquor is to be saturated by chloride of barium. The weight of the sulphate of baryta obtained represents the sulphur of the sulphate, of the sulphite, of the hyposulphite and of the bisulphuretted hyposulphate. As the operations made with the first and second portions of the liquor furnish a cipher indicating the quantity of sulphur contained in the first three, the difference of the two weights will serve to determine the quantity of sulphur contained in the last, and, consequently, its total weight.

It is useful here to indicate that the washings of the sulphate of baryta, obtained in the preceding treatment, should be made with boiling distilled water, and continued for a long time, because it is mixed with much iodate of baryta, formed by the action of the chlorine on the iodides contained in the liquor, and this iodate is very sparingly soluble in water. If the washings be insufficient, during the calcination of the precipitate, there will be a disengagement of violet vapors, indicating the presence of the iodate, and baryta will remain in the residue; it will then be easy to separate it by means of dilute hydrochloric acid.

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* If the solution were acidulated before being treated with the chloride of barium, rather too great a weight of sulphate of baryta would be obtained; the excess of weight might even amount to several centigrammes: it probably arises from the partial oxidation of the sulphurous acid at the moment of its separation from its combinations.

Fourth Portion.—It remains only to estimate the hyposulphuric acid. To learn the quantity of this acid, it will be sufficient to know the total weight of the sulphur; for then, after having rendered to the other four acids what belongs to them, the difference will be that of the hyposulphuric acid.

But the estimation of the whole of this sulphur presents some difficulties. The sulphatisation of the inferior compounds of sulphur is very easily operated when wc act on well dried products; but it is, on the contrary, almost impossible not to lose sulphur when solutions are treated. Nitric acid, even the most concentrated, and aqua regia always allow sulphurous acid to escape. Chlorine is then recommended, but this reagent is no longer certain when it is made to act on the solution of a hyposulphite; from the commencement of the operation, it precipitates sulphur so finely divided, that it often cannot be collected on the filter, and which it is incapable of redissolving; on the other hand, we have seen that it does not sulphatise hyposulphuric acid at the ordinary temperature.

When we have to analyse liquors which cannot be evaporated to dryness without being decomposed, and without losing gaseous sulphurous products, in order that it may be possible to bring them to the dry state without loss of sulphur; a small quantity of caustic soda must be added to the liquors, in order to retain the sulphurous gases, and to allow of evaporation. As regards the solid residue, it serves for estimating the total sulphur; it is sufficient to treat it in the ordinary manner by fuming nitric acid.

We have supposed an extremely complex mixture, but, fortunately, a case of this nature is of rare occurrence. It may be conceived that the *modus operandi* shonld be modified according to the solution to be operated on.

If, instead of a bisulphuretted hyposulphate, the liquor contained M. Langlois' acid, no alteration should be made in the operations.

MEMOIR ON THE ACTION OF SULPHUROUS ACID ON THE METALS.*

BY MM. FORDOS AND GELIS.

We have formed the project of successively studying all the circumstances in which the hyposulphites and their analogues are formed, and we have commenced with the study of the action of sulphurous acid on the metals. This action is interesting in more than one respect; for not only may it furnish very various oxygenous products of sulphur, but it also seems to present some remarkable peculiarities which seem to distinguish sulphurous acid from almost all other acids. In fact, when a dilute acid acts on a simple metallic body, which possesses the property of decomposing water, it is ordinarily this liquid that furnishes the oxygen necessary for the oxidation of the metal; sulphurous acid appears to deviate from this common law, and to act on iron, zinc, &c., without the elements of water appearing to enter into the reaction.

We have endeavored to demonstrate, in this Memoir, that the differences observed always arise from the principal action being complicated with secondary reactions, the whole of which is difficult to seize; that all the acids act in the same manner on the metals of the first three sections; and, in order to be enabled to generalise this action, we have been obliged for a time to abandon the compounds of sulphur, in order to examine, *de novo*, in this point of view, the action of some other acids, namely: nitric and chloric acids, on the metallic substances.

The action of sulphurous acid on the metals has already engaged the attention of a great number of observers. Berthollet first remarked its action on iron; he saw that its solution was effected without any disengagement of gas. Afterwards, Fourcroy and Vauquelin completed his observation, and extended it to zinc and tin. These two chemists established, in a general manner, that, when sulphurous acid acts on a metal, two salts,—a sulphite and a hyposulphite,—are always formed. Notwithstanding the results of these chemists, and although their opinion is professed by Gay-Lussac and Pelouze, all the treatises on chemistry lately published, in stating that this subject demands a new examination, admit that a hyposulphite alone is formed,

$$Fe + SO^2 = FeO, SO.$$

M. Dumas thinks that it would be more probable to suppose the formation of a bisulphate of the sulphuret.

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* *Comptes Rendus*, No. 19, May 15, 1843.

M. Persoz, who regards as demonstrated the existence of the basic hyposulphites, MO, SO, thinks that sulphurous acid combines directly with the metal without being decomposed in the manner of a simple body.

In all these formulæ, water never intervenes. The results which we shall indicate further on will reply to each of these hypotheses, and this brief explanation will suffice to give an idea of the question which we have endeavored to elucidate.

We have studied the action of sulphurous acid on the metals of the three first sections which we could procure, namely: zinc, iron, tin, nickel, cadmium, potassium, and sodium.

When potassium is thrown into an aqueous solution of sulphurous acid, this metal acts as it would do in pure water; it burns at the surface of the liquid, producing potassa, which combines with the sulphurous acid.

But by treating sulphurous acid dissolved in water, by alloys containing potassium,—the amalgam of potassium, for example,—the solution of the metal is effected at the bottom of the liquor: it also disengages hydrogen, owing to the rapidity with which the water is decomposed; but there is formed, besides the sulphite, some hyposulphite.

Sodium acts like potassium.

Zinc furnished to us the results already obtained by Fourcroy and Vauquelin, that is to say, two salts, a sulphite and a hyposulphite. These chemists had not analysed these compounds; we have done so.

The sulphite is sparingly soluble in water; its formula is

$$\mathrm{Zn\,O,\ SO^2 + 2HO}.$$

The hyposulphite contains 2 equivalents of sulphur to 1 equivalent of metal, that is to say, $\mathrm{Zn\,O,\ S^2\,O^2}$. It is not, therefore, a subhyposulphite, as was supposed; but we have not been able to estimate its water of crystallisation, because it is not possible to obtain it in the solid state. It is destroyed with the greatest facility, and the study of its mode of decomposition has furnished us some curious results.

The solution of hyposulphite of zinc is colorless, transparent, and inodorous; it is not precipitated by absolute alcohol: but if we seek to obtain the crystallised salt, either by placing the liquor *in vacuo*, or by leaving it to spontaneous evaporation, there arrives a moment of concentration when the solution becomes turbid; a white deposit of sulphuret of zinc is formed, and the liquor contains monosulphuretted hyposulphate of zinc. This decomposition, which is common to a great number of hyposulphites, is exactly represented by this equation:—

$$\mathrm{2(Zn\,O,\ S^2\,O^2) = Zn\,S + Zn\,O,\ S^3\,O^5}.$$

The monosulphuretted hyposulphate of zinc is itself a very unstable compound; the slightest elevation of temperature decomposes it; the hyposulphite of zinc, also, evaporated to dryness, gives, as a final result, sulphuret of zinc, sulphur, sulphate of zinc, and a disengagement of sulphurous acid.

Iron rapidly dissolves in sulphurous acid, and gives at first crystals of $\mathrm{SO^2\,FeO,\ 3HO}$. If we continue to evaporate *in vacuo* the liquor from which this salt is separated, we sometimes obtain crystals which contain hyposulphite; but most frequently, and without our being able to observe very considerable differences in the *modus operandi*, the liquid contains, mixed with the hyposulphite very unstable sulphuretted hyposulphate, which is decomposed, by concentration, into sulphur, sulphurous acid and sulphate.

Nickel gives a sulphite and a hyposulphite; the formula of the sulphite of nickel is—

$$\mathrm{Ni\,O,\ SO^2,\ 6HO}.$$

Arrived at this point of our work, it appeared to us very probable that the law enunciated by Fourcroy and Vauquelin would be confirmed, and that tin and cadmium would furnish, like the metals already mentioned, a sulphite and a hyposulphite. But, although all the reasons drawn from analogy were in favor of this view (for, indeed, what metal resembles zinc more than cadmium?), facts have given it a glaring contradiction.

Sulphurous acid also dissolves cadmium without disengagement of gas; but, independently of sulphite, at the commencement of the operation, sulphuret of cadmium is obtained in large quantity.

Tin gives the same results.

Whence come these differences?

In one case, sulphite and hyposulphite are formed; in another, sulphite and sulphuret. Although each of these results may be separately conceived, and expressed by very simple formulæ, they cannot be explained without admitting the intervention of water, at least to renounce admitting chemical analogies of which a thousand examples have demonstrated the evidence. If, on the contrary, it be admitted that sulphurous acid acts like another acid, like sulphuric acid, for example, all the facts explain themselves. It is only necessary to call to mind a well known property of sulphuretted hydrogen, namely: that there are metallic solutions which are always precipitated by this reagent, whilst others are never so when the liquor is acid; and, in the circumstances which occupy us, there is always a great excess of sulphurous acid. These facts admitted, we will explain the phenomena. As soon as the contact is established between the water, the sulphurous acid and the zinc, the water is decomposed; a sulphite and nascent hydrogen are produced; this hydrogen, as soon as it is formed, meets with sulphurous acid; now, we have proved, in another Memoir, published in 1841, that in this case, the sulphurous acid is reduced, and that sulphuretted hydrogen is the product of this reduction. What happens? If the metallic sulphite contained in the liquor can be precipitated in the state of sulphuret in presence of an acid, by sulphuretted hydrogen, sulphuret will be precipitated, and the excess of sulphite will remain in the liquor. This is what we have observed as regards cadmium and tin. If, on the contrary, the sulphuretted hydrogen has no action on the metallic solution in which it is formed, these decompositions will take their course; if they be in presence of a great excess of sulphurous acid, the two gases are mutually decomposed; water and sulphur are formed, but this sulphur cannot be precipitated, for it meets with sulphite ready to dissolve it, in order to form a hyposulphite or a sulphuretted hyposulphate. Such are also the results which we obtained with zinc, iron, nickel, and the alkaline metals.

By admitting this view, not only are the principal phenomena explained, but also all the secondary results are cleared up.

By acting on the metals of the first three sections, nitric acid likewise determines the decomposition of water. Kuhlmann has proved it with respect to the metals of the third section; hydrogen, instead of being disengaged, remains in the liquors in the state of ammonia: he likewise admitted it, in theory, as regards the alkaline metals; but he was unable to prove it by experiment, which he attributed to the high temperature developed during the reaction. We are happy in being able to prove the accuracy of this opinion. It was sufficient for us, indeed, to obtain ammonia with potassium and sodium, to alloy these metals with mercury: the amalgam produced was attacked by dilute nitric acid, without too considerable a disengagement of heat. As mercury treated alone does not give ammonia, that obtained from the alloy can proceed only from the alkaline metal.

Tin may be dissolved in nitric acid without disengagement of any gas; but when gases are disengaged, we have ascertained, contrary to the general opinion, that they are so much the more nitrogenous as the action is less vivid.

Chloric acid has been wrongly placed among the acids which attack the metals, disengaging hydrogen; the quantity of hydrogen which it disengages in attacking iron is little or none, and with zinc the quantity is very slight; it is so much the less as the action is more slowly carried on. A very simple experiment puts in evidence the reduction of chloric acid: if a mixture be made with sulphuric acid, water and chlorate of potassa which does not precipitate nitrate of silver, it is sufficient, in order to obtain very abundant flocks of chloride of silver with this mixture, to steep in it, for a few minutes, a sheet of zinc.

ACTION OF POTASSA ON THE OXIDES OF COPPER, IRON, AND SILVER.*

BY A. CHODNEW, OF ST. PETERSBURGH.

In all treatises on Chemistry, it is said that peroxide of copper is insoluble in potassa. Thus, according to Berzelius, peroxide of copper does notdissolve by the humid way in potassa or soda, and when these oxides are heated together to redness, a green mass is obtained, which yields its alkali to water, the peroxide of copper remains undissolved. Peroxide of copper, in the same circumstances, expels the carbonic acid from the alkaline carbonates. Mitscherlich likewise says that a solution of potassa precipitates the salts of copper of a light blue, and that the precipitate is insoluble in an excess of the reagent.

Gmelin alone, reporting Proust's experiments, says that peroxide of copper is dissolved in an excess of potassa, and that the solution diluted with a great quantity of water reproduces the precipitate.

Chodnew, having observed in his analytical investigations that potassa dissolved peroxide of copper in certain circumstances, has made some direct experiments on this subject.

A piece of hydrate of potassa maintained in fusion during ten minutes in a crucible of chemically pure copper, the air having free access, produced a deep blue mass which became slightly green at the surface by cooling. According to the generally admitted opinion, the copper of the crucible is oxidised in this operation at the expense of the oxygen of the water combined with the potassa, and peroxide of copper is formed, which combines with the potassa. Chodnew thinks, on the contrary, that is not peroxide of copper, but protoxide of copper which is formed at the expense of the oxygen of the water, and which, under the influence of the oxygen of the air, is converted into peroxide of copper; for if the operation be carried on sheltered from the air, no peroxide, but only protoxide of copper is obtained. The fused and cooled mass is not decomposed by contact with water, as is generally admitted, into hydrate of potassa and peroxide of copper; a considerable portion of the latter is dissolved and gives to the solution a bluish tint, analogous to that of the solution of peroxide of copper in ammonia. To this solution we may add as much water as we think proper, without its becoming turbid; the peroxide of copper which is separated is first black, and afterwards becomes brown. This operation presents a phenomenon for which it is not easy to account: if the solution be filtered immediately after the immersion of the mass in water, it indefinitely retains its blue color and the peroxide of copper remains dissolved; but if the solution be left in contact with undissolved oxide, it is gradually entirely decolored, and after a few days it no longer contains peroxide of copper. The affinity of potassa for peroxide of copper is perhaps weak enough for the presence of the latter to suffice for destroying the combination. The same result is obtained by fusing peroxide and protoxide of copper with potassa in a silver crucible.

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* *Journal für praktische Chemie*, Vol. XXVIII.

Chodnew found that the quantity of peroxide of copper which dissolved in potassa is not proportional to the quantity of potassa employed. Thus, a solution which contained 12·7 of hydrate of potassa, contained 0·0735 of peroxide of copper, whilst another which contained 11·6 had dissolved only 0·0058 of peroxide of copper. The author adds, nevertheless, that the quantity of oxide dissolved absolutely depends only on the time during which the mass is maintained in fusion.

The principal reagents produce on these solutions the same reactions, but weaker, as on the acid solutions; other reagents are without action unless the liquor is previously neutralised by an acid.

Chodnew has remarked besides, conformably to the ancient data of Roloff, which had escaped the attention of chemists, that when a great excess of a solution of caustic potassa is added to solutions of sulphate, nitrate or chloride of copper, the first precipitate is completely redissolved and gives a bluish solution. However, some precautions must be observed: though the solutions of copper and potassa cannot, without there being immediately formed a brown oxide, which dissolves in potassa with much greater difficulty than the hydrated oxide; in the second place, the solution of copper must be diluted, for otherwise the brown oxide is likewise formed by the heat evolved. Much less peroxide of copper is dissolved by this process than by fusion. 0·13 grs. of oxide of copper require rather more than 50 grs. to be dissolved. The solution, so far from being rendered turbid by boiling, becomes even more limpid; an excess of water does not precipitate the metallic oxide, as Proust stated. The hydrate of copper does not alone possess the property of dissolving in water, it also partakes this property with the calcined peroxide of copper, which is dissolved in it by aid of prolonged boiling. The solution of potassa dissolves a quantity of peroxide of copper so much the greater and so much the more easily, as it is more concentrated.

When hydrate of potassa is fused, out of contact with the air, in copper crucibles, after cooling a red mass is obtained, which, redissolved in water, leaves a residue of protoxide of copper, under the form of a brick-red powder; however, a small quantity of the latter remains in the solution.

The protoxide of copper is also dissolved by boiling in an excess of hydrate of potassa. The author has assured himself of this property with recently precipitated protoxide of copper, and with that previously heated to redness; the result was the same in both cases. The solution is colorless; it becomes brown by sulphuretted hydrogen, and precipitates sulphuret of copper when left to itself.

Mr. Chodnew has likewise proved that oxide of iron is soluble in potassa, either by the prolonged boiling of the hydrated oxide, recently prepared with a solution of potassa in a platinum capsule, or by fusing the potassa at a red heat in an iron crucible, and redissolving the mass, when cooled, in water. In both cases, a very slightly yellowish solution is obtained, which contains oxide of iron in solution.

Oxide of iron which has previously been heated to redness does not dissolve. Recently prepared hydrated oxide of iron does not dissolve when the solution of potassa is dilute, so that recently precipitated alumina and oxide of iron may easily be separated by making use of dilute solution of potassa.

Finally, although silver resists the solvent action of potassa better than other metals, gold excepted, it is not entirely unattackable, for Chodnew obtained a yellowish mass by fusing potassa for ten minutes in a silver crucible. Dissolved in water immediately after cooling, the fused mass left a black powder formed of a mixture of oxide of silver and metallic silver, but the solution did not contain a trace of that metal.

ON THE SALTS CONTAINED IN THE MILK OF THE COW, AND ON THE ANALYSIS OF MILK.*

BY JULIUS HAIDLEN.

The salts of the milk in which the suckling for a long time finds the inorganic materials necessary for the formation of the bones, of the blood, &c., merit our attention as well as its organic principles. However, the analyses of the chemists who have been occupied with the study of them, (Pfaff and Schwartz, and Meggenhofen for the salts of the milk of woman, and Berzelius for those of the cow's milk,) are far from agreeing with one another, and this want of agreement has led Professor Liebig to direct Dr. Haidlen to make new investigations on this subject.

This chemist operated on pure and quite fresh cow's milk. Of eight cases, he found the reaction of milk slightly alkaline in seven, and acid in one; the last was obtained from a cow which had been ill a short time before. He first incinerated a portion of the milk in order to arrive at a general knowledge of its inorganic principles, and he found in the ashes, conformably with other analyses, chlorine, phosphoric acid, carbonic acid, and a small quantity of sulphuric acid, in combination with potassa, soda, lime, magnesia, and oxide of iron; he easily demonstrated, in the serum of milk, coagulated by acetic acid, besides the presence of the bases which have just been mentioned, the existence of chlorine and phosphoric acid, but he never could detect sulphuric acid in it: it must, therefore, be regarded as a product of the oxidation of the sulphur contained in the caseïn. As regards the carbonic acid, its presence always observed in the ashes of milk is indicated in most analyses as arising from a lactate supposed to exist in this liquid (lactate of soda). Haidlen has arrived at this result, that normal milk does not contain lactic acid, but that the formation of this acid commences immediately after it is drawn from the cow, and in some cases even in the animal, and that it then produces the acid reaction of milk: he has seen, moreover, that this liquid contains a quantity of phosphoric acid precisely corresponding to the lime and magnesia which it contains.

If milk be coagulated by acetic acid, and if the serum be evaporated to dryness, and afterwards treated by alcohol, by the evaporation of the alcoholic solution and calcination of the residue, a mixture of salts is obtained which, dissolved in water, has a strongly alkaline reaction, and which, by the addition of acids, disengages carbonic acid; it is formed of alkaline carbonate, chloride of sodium, and chloride of potassium. Now, as normal milk does not contain lactic acid, with which this alkali removed by acetic acid can be combined, it would be very natural to conclude that it was in combination with the caseïn; in favor of this opinion is the circumstance, that pure caseïn is but very sparingly soluble in water, out of proportion with the quantity of this substance which milk contains; that, on the contrary, an extremely slight addition of soda or potassa is sufficient to immediately dissolve it, and that, not only do the alkalis exert this action on pure caseïn, but also that a very small quantity of alkali dissolves with the greatest facility a mixture of caseïn and phosphate of lime.

If it be admitted, as all circumstances authorise, that the pretended soluble modification of caseïn, contained in recent milk, is nothing more than a combination of caseïn with an alkali, the phenomena of the coagulation of milk are explained in a simple and satisfactory manner. The action of the acids, as well as of the earthy and metallic salts, then, consists of a simple decomposition of the combination of caseïn. In the first case, free caseïn is obtained; in the second, an insoluble combination of this substance with the base of the salt which has operated the coagulation. This view also presents to us the best explanation of the coagulation of milk by rennet. According to the observation of M. Pelouze, the immediate consequence of the action of the mucous membrane of the stomach on an aqueous solution of sugar of milk is a conversion of the latter, the principal product of which is lactic acid. Now if, setting out from the moment when, under the influence of favorable external conditions, the rennet is in contact with the milk, lactic acid is formed, the period soon arrives (as the quantity of alkali combined with the caseïn is very small, 42 to 45 *milligrammes* in 100 *grammes* of milk) when the lactic acid formed is sufficient to saturate this alkali, and to separate the caseïn at a higher temperature. The analysis of Scherer, fully confirmed by those of Rochleder, have demonstrated that, in the coagulation of milk by an acid, the latter does not form any combination with the caseïn.

The salts of the cow's milk are, according to the above:—

Phosphate of lime.
Phosphate of magnesia.
Phosphate of iron.
Chloride of potassium.
Chloride of sodium.
A combination of an alkali (soda) with caseïn.

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* *Annalen der Chemie und Pharmacie.*

The author found in 100 parts of milk from two cows :—

	I.	II.
Phosphate of lime	0·231	0·344
Phosphate of magnesia	0·042	0·064
Phosphate of iron	0·007	0·007
Chloride of potassium	0·144	0·183
Chloride of sodium	0·024	0·034
Soda	0·042	0·045
	0·490	0·677

It is not surprising that the quantity of salts contained in No. II. exceeds by more than one-fourth that of No. I., when we reflect on the great number of circumstances which may modify the concentration of milk: it is, on the contrary, interesting to have found in two different cows the same salts in perfectly similar relative quantities.

The author thinks he has discovered, in the course of his investigations, a method for the quantitative determination of the three most important principles of milk (caseïn, sugar of milk, and butter), exempt from the defects of the methods of separation hitherto employed, and very easily executed. The object of a new method of analysing milk, should, in his opinion, tend principally to determining with precision the sum of the fixed principles, and to put each body which ought to be isolated, in such a state that it dissolves with facility in its own solvent, and is perfectly insoluble in that of others.

Dr. Haidlen found these advantages in the coagulation of milk, by a suitable quantity of sulphate of lime. If milk be mixed with about $\frac{1}{50}$ of its weight of this salt, in fine powder, and heated to 212° Fahr., a complete coagulation is operated, and, by evaporating the whole to dryness, a brittle mass is obtained, which is easily pulverised; if it be reduced to a fine powder, the butter may be completely removed by ether, the sugar of milk and soluble salts by hot alcohol of sp. gr. 0·85, and an insoluble residue of caseate of lime and sulphate of lime remains. The alcoholic solution gives, with chloride of barium, a scarcely perceptible turbidness, whence it is evident that the sulphate of lime dissolved by the alcohol, gives no error in the result. 100 parts of milk gave by this method :—

Butter	3·0
Sugar of milk and soluble salts	4·6
Caseïn and insoluble salts	5·1
	12·7

Woman's milk, which the author had an opportunity of examining with relation to its proportion of butter, sugar of milk and caseïn, had a very strongly alkaline reaction, and it was only difficultly coagulated by sulphate of lime.

No. I., of very good appearance, gave in 100 parts, 10·8 of residue, which was formed of :—

Butter	3·4
Sugar of milk	4·3
Caseïn	3·1
	10·8

No. II. at once announced, by its aqueous appearance, its poverty in fixed principles. 100 parts gave 7·2 of residue, which contained :—

Butter	1·3
Sugar of milk	3·2
Caseïn	2·7
	7·2

WHITE PROTOCHLORIDE OF GOLD.*

BY ALFONSE MEILLET.

Little attention has been paid to the singular reaction which is operated in the preparation of chloride of gold, destined for fixing photogenic images. Thus, one gramme of hydrochlorate of chloride of gold (chloride of gold of commerce) is dissolved in a pint of water, and three *grammes* of hyposulphite of soda are dissolved in another pint of water, and the chloride of gold is poured gradually, stirring continually, into the hyposulphite; when we operate in the contrary way, and pour the solution of hyposulphite into that of gold, there is a decomposition, the liquid becomes black, and sulphuret of gold is precipitated.

When the operation is properly performed, the solution is immediately decolored. This change of a naturally highly-colored salt, in the presence of a neutral salt, was, however, worthy of attracting attention. The following is my view of this reaction.

By pouring into hyposulphite of soda a solution of hydrochlorate of chloride of gold, the hydrochloric acid displaces a certain portion of hyposulphurous acid, which is immediately decomposed into sulphur and sulphurous acid; the sulphur is redissolved by the undecomposed hyposulphite, which, as is known, is capable of dissolving a great excess of it; the sulphurous acid acts on the chloride of gold, and brings it to the minimum, and is itself converted into sulphuric acid, and afterwards into sulphate of soda. It has been pretended that a hyposulphite of gold is formed, but analysis demonstrates to the contrary. In order to procure this salt, dissolved chloride of gold is poured into a solution of hyposulphite of soda, it is filtered to free it from a little precipitated sulphur, and evaporated to the consistence of a very thin syrup. The capsule is then placed under a bell-glass containing lime, and the evaporation is left to finish. Several very different salts crystallise; thus, the chloride of sodium in very distinct cubes, as well as prisms of sulphate and hyposulphite of soda, are observed; the chloride is crystallised in the spaces in small fine needles. The extraneous crystals are separated as much as possible, especially the chloride of sodium, and it is treated by cold alcohol at 90 per cent. The chloride of gold alone is dissolved; it is filtered and left to spontaneous evaporation; it is then very white, and crystallises in very fine small needles. This salt is not precipitated by the salts of iron, mercury, or tin, at the minimum; it is only the alkaline hydrosulphates which precipitate it in the state of light yellow sulphuret; it does not stain the skin, and has only a very slight taste; very different from the disagreeable metallic taste of chloride of gold. Finally, it does not present any of the reactions of any of the salts of gold. I shall hereafter study its medical properties, compared with those of the ordinary salts of gold. The salt analysed gave:—

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* *Journal de Pharmacie*, June, 1843.

Gold	50·715
Soda	11·788
Chlorine . . .	37·497
	100·000

By supposing it to be formed of 1 atom of protochloride of gold, and 1 atom of chloride of sodium, we should have:—

Chloride of gold . . . 67·200 = Chlorine 16·485 + Gold 50·715
Chloride of sodium . . 32·800 = Chlorine 21·012 + Sodium 11·788

The salt would be represented by the formula:—

$$CH^2 Au^2 + CH^2 SO.$$

The isolated chloride of gold therefore contains in hundredths:—

Chlorine 24·54; gold 75·46: and the chloride of sodium:—

Chlorine, 60·34; sodium, 39·66.

ON THE COLORING PROPERTIES OF ALÖETIC ACID.*

BY M. BARRESWILL.

M. **Barreswill** announces an interesting fact which will not fail to attract the attention of naturalists and chemists. Aloëtic acid melted with colophane, gives rise to a most intense blue color. He has not yet been able to extract from it this coloring matter, but he has remarked that the resin, thus colored blue, easily dissolves in alcohol, in the essences and the fatty bodies, allows of its being employed to turn these substances blue at will, and to give a blue color to injections. The tinctorial power of the aloëtic blue is very considerable. A few *decigrammes* of crude aloëtic acid, melted with 20 *grammes* of resin, are sufficient to color a pound of fat.

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* *Journal de Pharmacie*, June, 1843.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

ON THE PRODUCTION OF THE PRECIOUS METALS IN MEXICO, CONSIDERED IN ITS RELATIONS TO GEOLOGY, METALLURGY AND POLITICAL ECONOMY.*

BY M. SAINT-CLAIR-DUPORT.

(*Concluded from page* 309.)

Mercury acts as a chemical agent and as a simple solvent: in the first case, it reacts on the chloride of silver, which it decomposes in order to combine with the chlorine; in the second, it seizes metallic silver disseminated in more or less attenuated particles in the ore.

The bichloride of copper formed by the contact of *magistral* and sea salt, in reacting on the sulphuret of silver, converts the silver into chloride of silver, and is transformed into sulphuret, according to M. Boussingault's experiments; but this chloridation is only superficial, as M. Duport has observed in experiments performed with care.

On account of the double part performed by mercury in the amalgamation, its loss may be attributed to three causes:—

1. To the reduction of chloride of silver by the mercury.
2. To the direct chloridising action of bichloride of copper on mercury.
3. To mechanical action.

The last is not very important. The first may be partly avoided by employing a more oxidisable metal than mercury. To master the second, it is necessary to separate the chloridation of the sulphurets of silver from the amalgamation; but in the *patio*, the chloridation being only superficial, and the quantity of sea salt employed being much too small to at once dissolve all the chloride of silver, the presence of mercury during the whole time of the operation becomes indispensable. Thence proceeds the loss. M. Duport, from his experiments, has arrived at this conclusion, that a saturated solution of common salt, at the ordinary temperature, dissolves per litre, $0^{gr}\cdot570$ of silver combined with chlorine: that its solvent power seems to follow a proportion uniform with the temperature, and that at about the boiling temperature this power is four times as great as at 50° F., and that it is extremely feeble near Zero.

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* *Comptes Rendus*, No. 17, April 24, 1843.

In chloridising by the dry way, as in Saxe, reducing by iron and afterwards amalgamating, the loss of the mercury is reduced to the mechanical loss. But this preliminary operation requires fuel, and from three to four times the weight of salt employed in *patio*, the price of which, in Mexico, represents one half more than the value of the mercury lost, although its present price is almost quadruple that charged by the Spanish government.

Although the Mexicans possess very great skill in the method of *patio*, they still leave in the residues a proportion of silver, varying according as a greater or smaller proportion of double sulphurets are found in the ores.

At Guanaxato, where the ore is composed of native silver, or sulphuret of silver, with little pyrites, galena or blende, the loss is 10 per cent. of the total richness.

At Fresnillo, where the ore abounds in galena, pyrites and blende, it amounts to 28 per cent.

At Zacatecas, the ore of which contains much antimonio-sulphuret of silver, the loss is from 35 to 40 per cent.: sometimes all these losses, which amount to two-fifths of the total richness, would not occur if they possessed a good method of chloridation by the humid way, and towards which all chemical investigations should be directed. What advantages would not result from it as regards the production of the precious metals in Mexico, where the miners are easily discouraged, on account of the little profit which this production procures them.

A fact worthy of remark is, that since the discovery of amalgamation by *patio*, due to Medina del Campo, namely, for three centuries, the progress of chemistry has brought about no change in the manner in which it was then practised, so that it seems immediately to have reached perfection. Indeed, M. Duport, who had at his disposal the archives of the family of Cortez, found documents proving that the quantity of silver extracted from the ores of Tasco, from 1570 to 1585, corresponds to a quality of 0·0016, and the loss of mercury at 150 per 100 of the weight of silver obtained; these proportions are sensibly the same as those observed in the ores and amalgamation of the present period.

M. Duport thinks that he may conclude, from his observations and experiments, that unless an easy and economical means of completely chloridising the sulphuret of silver and the double sulphurets, be found, or a new solvent for the chloride of silver more energetic than saline water and less expensive than ammonia, the treatment by *patio* is little susceptible of important improvements.

Amalgamation by heat (*cazo*),—invented by Alonzo Barba, and thus denominated, because it is operated by means of heat in a boiler with a copper bottom, a metal which reduces the chloride of silver,—is less used in Mexico than in South America, where the ores contain a greater quantity of chloride or bromide of silver, a condition indispensable to amalgamation. In Mexico, it is applied only in the localities where the *colorados* are treated, which ordinarily contain metallic silver, chloride and bromide of silver.

The ores are made to undergo the same mechanical preparation as for amalgamation by *patio*. M. Duport's work contains the plans and all the details relative to the construction of the apparatus, to the management of the operation, to the crude produce in silver, &c.,—details which were hitherto but imperfectly known.

Having immediately ascertained that this treatment, which was little employed in Mexico, was susceptible of great improvements, M. Duport repaired to one of the principal mines, and established there a manufactory (*hacienda*), with the view of making experiments on the largest possible scale, namely, on 5 and even 10 *quintals* of ore at a time; in order to see whether it was not possible to reduce the loss of mercury to an almost insignificant quantity, and whether all the silver ores of Mexico might not be treated by this process. It is his intention, ultimately, to communicate to the Academy the results of these experiments, which are so much the more important, as they have been made in such a manner that no change is required in the arrangement of the apparatus which he used, in order to their being employed in an industrial undertaking. Although he has not yet published anything, we may mention, from what he has been kind enough to communicate to us, that he has found an ingenious means of diminishing the loss of mercury, by putting into the ore only four times as much mercury, by weight, as of the silver contained, and this at different times, in such a manner as to make an amalgam in definite proportion; for, so long as the mercury does not exceed this proportion, the chloride of silver is decomposed by the copper, and not by the mercury; and, moreover, the copper bottom of the *cazo* is not amalgamated,—an inconvenience which cannot be too carefully avoided, since the operation ceases as soon as this amalgamation takes place. We may add that another improvement, no less important than the preceding, and of which M. Duport defers the publication,—an improvement the accuracy of which one of your committee (M. Becquerel) has verified,—completes the investigations of M. Duport in the improvements which he has endeavored to make in the treatment of all the ores of silver by *cazo*, with the exception of argentiferous galenas, with which one of your committee is specially occupied.

M. Duport, in treating the question of the precious metals in Mexico, has not confined himself to a geological description of the country, to making known the principal metalliferous beds, the mode of extracting the ore in each of them, the different modes of treatment, and the average product of each manufactory; he has also entered into great developments concerning the duties collected on the products of the mines, on the assays, the refineries, the mints, the comparison of the values coined at different periods, the export duties, the average cost of production, and the probabilities of variation in the production. He has, therefore, viewed the question in its whole extent, since he has treated it scientifically and practically, and with reference to political economy. The Academy will regard, not without interest, the results laid down in this respect, in the chapters relative to the different matters which we have just mentioned.

In 1504, soon after the Conquest, the impost was fixed by the Court of Madrid, at one-fifth of the produce (*quinto*); in 1548 it was reduced to one-tenth. There also existed supplementary duties, on the fusion, assaying, and stamping, which continued to be collected until the political emancipation of Mexico. In 1822, the duties were reduced to 3 per cent. of the value of the metals; afterwards, another duty of 1½ per cent. was added to it, fixed on the establishment of the mine.

As regards the assays, the refineries, and mints of Mexico, although M. Duport has given details concerning this subject, which are replete with interest and perfectly new, it has appeared to us impossible to speak of them, even succinctly, in the fear of giving too great an extent to this report. Nevertheless, we have considered it our duty to give an account of the cost of production,—a fundamental question, in which, in some measure, the future welfare of Mexican metallurgy resides, and which M. Duport has treated in the most explicit and satisfactory manner.

M. Duport thus sets forth the production by each of the three modes of treatment. Cold amalgamation furnishes alone 82 per cent.; amalgamation by heat, 8; fusion, 10: relative to the cost of the silver obtained by these different treatments, it will be conceived that various elements, which singularly complicate the question, must be taken into consideration. To facilitate its solution, M. Duport takes, as a point of departure, 1 *kilogramme* of silver, on board of a ship starting from one of the ports of Mexico, and fixes the proportion of necessary expense by its production in *grammes* of silver. By deducting the duties and expenses of treatment, a balance remains which represents the sum applicable to the expenses of extraction, and to profit. He afterwards supposes a common richness of two-thousandths (0·002), the average quality of the ores of Mexico. He states the loss of mercury at 13 ounces per mark.

The expenses of the treatment by *patio*, may be calculated at the rate of 14 piastres per 1000 *kilogrammes*.

He includes, in his calculation of the cost of production, the expenses of conveyance, port dues, commissions, &c.

These bases laid down, he thus establishes the cost of 1000 *grammes* of shipped silver:—

Duty to government including coining . . .	145 *grammes*
Expenses of fusion, carriage and shipping . . .	35 ,,
Treatment and mercury	454 ,,
Remainder free for the extraction of the ore, and for profit .	366 ,,
Total .	1000

It is therefore evident, according to this, that the balance of 366 *grammes*, out of the 1000, is the sum which remains for the cost of the extraction of the ore, and the possible profit; but, as the sums represented in *grammes* of fine silver, are expended at

Mexico, there must be added to the balance of 366 *grammes*, all the *grammes* absorbed by carriage, and the import and export duties; so that there remains a total of 446 *grammes* of silver in coined specie at Mexico, to defray the expenses of extraction; but if it be considered that these 446 *grammes*, worth rather less than one hundred francs, should pay for the extraction of 500 kilogrammes of the chosen ore, we may easily be convinced that, taking into consideration the depth of the mines, the high price of hand labor, and of all the agents necessary for the works, there often remains no profit, and the companies incur loss.

Such is the deplorable state of mining industry in Mexico!

Passing on to the probable variations of production, M. Duport enumerates the general and particular causes which may influence these variations, exhibiting a profound knowledge of the geology of the mining districts, and quotes in this respect a striking example which proves that beds worked for three centuries are, perhaps, not superior to those which remain to be explored, for every miner well versed in the art of mining. This example is that given by M. Laborde, who, towards the end of the last century, visited the mines of Zacatecas, the diminution of whose products had caused the works partly to cease, discovered after a few explorations, the rich vein of *vetagrande*, which, from 1827 to 1839, furnished to circulation nearly 150,000,000 francs. But if, as Baron Humboldt said forty years ago, Mexico contains sufficient silver to inundate the world, quite recognising the truth of this, M. Duport is not so convinced of the possibility of the means of extraction, and of the advantages to be derived from it, and he is thence led to treat of the probable improvements to be introduced into the means of working and of treatment, which are connected with the question of political economy with which your committee has necessarily been occupied, on account of their mutual dependence.

These improvements are numerous and particularly complex; they relate principally to the probable changes which may be introduced into the means of working and of treatment. M. Duport has ascertained that in the means of working at present in use, great defects exist, at the head of which must be placed the excessive deficiencies of investigation, and a complete disregard for the data acquired by experience. Besides, a good system of removing the waters, which is so necessary for the well-being of a mine, is entirely neglected. M. Duport afterwards calls attention to the employment of iron and powder, which are the objects of a very important expense, as the former is obtained from abroad, the Mexicans being little or not at all engaged in its manufacture,—and as the powder, which is of very bad quality, is under administration.

The hand-labor appears susceptible of variations which have not escaped M. Duport: its price at the present period is moderate, and, according to considerations into which the author enters, by comparing the price of mine-labor with that of agriculture, he concludes that hand-labor should tend rather to increase than diminish. He afterwards examines the advantages which might result from the introduction of steam in certain localities, for removing the water; besides Fresnillo, which has greatly benefited by it, Plateros, which is on the point of obtaining advantageous results from it, may also be mentioned. If, then, in all the localities where fuel is cheap and sufficiently abundant for no failure of it to be feared, steam be made use of, the produce will no doubt be ameliorated. Nevertheless, the employment of steam, even in the interests of the mine, can be adopted only with much reserve. Thus, if the mines of Sombrerete and of Zacatecas were worked with the same activity as forty years ago, and if steam were exclusively employed, the working of Fresnillo, which is situated at a short distance, would cease to produce so advantageously as it now does, on account of the scarcity of fuel.

M. Duport afterwards examines the improvements to be introduced in several parts relative to the working.

Another question has attracted his attention; it is that which relates to the depopulation of some mining districts, at the time of the War of Independence, which was caused by an emigration at first voluntary, then compulsory, in 1828, of Spanish proprietors, who took refuge in Spain, and in the south of France, carrying with them an enormous amount of capital. This specie, which from 1820 to 1830 left Mexico, constituted the greater portion in circulation; and without the loans contracted in England by the republic, and the formation of English mining companies, the operations would have become impossible. However, these loans only partially remedied the evil, for the government was obliged to create resources which it did not find elsewhere. Credit was so much shaken, that the rate of interest amounted to 30 and even 40 per cent. per annum. This state of things was therefore opposed to the mines assuming their former splendour, and even paralysed every attempt at working. On the other hand, the English companies, generally ill-managed, obtained only pitiful results; with the exception of that of Bolaños, which had obtained a profit of about 25,000,000 francs. In these works at Zacatecas, it is not known when this still increasing decline in the working of the mines would have stopped, if the better administered treasury had not inspired a greater confidence, which decreased the rate of interest by one-half, and induced the speculators again to turn towards the mines. It must, therefore, be concluded from the preceding, that the old and new works will not be pushed with sufficient activity for the annual production to be exceeded, until capital is more abundant in Mexico.

M. Duport afterwards passes to the no less important question of the improvements of which the modes of treating the ores of silver are susceptible. The treatment by fusion is capable of great amelioration, not only in the construction of the furnaces, but also in the more rational employment of fluxes.

The treatments by mercury, in most of the localities of Mexico, are less expensive than treatment by fusion, and M. Duport thinks that they do not appear susceptible of any improvement, at least as regards the mechanical preparation of the ore, but nevertheless that it is possible that different parts of the process may be improved, and that the ingredients might be obtained at a lower price. The high price of mercury and its loss, about 13 ounces on the average, per mark, fetter the operations, and this state of things will subsist so long as the monopoly of this metal endures in Europe; the price of mercury exerting so great an influence on the mines, it may be asked what would be the consequences of a failure of this metal, if, from any cause whatever, the mine of Almaden ceased to produce it, or if its produce were diminished? The mines of Carniole being insufficient for the present wants, fuel failing in a great number of localities, what would then become of the extraction of the ore of Mexico, unless, indeed, China and Japan, where there is reason to suppose that there exist abundant mines of mercury, sent their products into the New World? Without that, this question would be very embarrassing and even unanswerable; then only fusion and amalgamation would be known; but since it has been demonstrated that chemical action and electricity may be applied, on a large scale, to the treatment of metals, the difficulties have disappeared.

M. Duport came himself, three years ago, to Europe, in order to acquire a complete knowledge of the investigations on this subject made by one of your committee,* and the application of electricity, as a chemical force for the extraction of silver, was made on 4000 kilogrammes of ore brought from Mexico, with the authority of the government, by the author of the Memoir, who himself repeated at Paris all the experiments whose general results had been communicated to the Academy at several public sittings. He proved, by himself, the possibility of the application on the large scale; the problem was then resolved in a general manner, but only partly in presence of other treatments, since it was necessary to compare the cost of the old and new systems. In this very important question let M. Duport speak for himself:—

"The question was reduced to a comparison of ciphers relative to the cost of the old and new systems, and the first investigations which I made concerning the metallurgy of silver had not, in the first instance, any other motives; but I did not delay to render them more complete, in order to furnish to metallurgists an exact view of the state in which the various treatments in Mexico are found, and to economists, information concerning the question of the present and even of the future production of silver, sufficiently complete for establishing with some exactitude, calculations concerning the value of this metal compared to other values. The result of my investigations has been favorable to the electro-chemical process as regards a great number of ores,—I say not only in the not very improbable hypothesis of the absolute failure of mercury, but even with the present high price of quicksilver; then we might be astonished that this process has not already received the commencement of application. The causes which are opposed to it, having very important general characters, relative to the establishment of every new process, I will, on this occasion, enter into some details.

"The simplicity of the apparatus for amalgamation in Mexico, is at once an obstacle to all innovation; then comes the *habitude* of an art practised for three centuries, and from that time perfectly studied in an economical point of view; the necessity of operating on considerable masses in order to be able to place any faith in the process, and the necessity, in the first instance, of entering into expenses so much the more burthensome as every industrial construction is very dear in Mexico, have shaken the zeal of innovators, who have often in the end for entire recompense, or, more properly speaking, for the sole guarantee for the sums employed, only the too doubtful protection of patents, in a country where the administration of justice is often very slow, especially in a case of this kind, which presents, in the best organised countries, difficulties without number."

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* *See* The Chemist, No. IX. Sept. 1840.

Among the other considerations advanced by M. Duport, we will quote the following:—Mercury being the principal chemical agent, its price must rise or fall according to the quantity employed. Hence its chance of falling, in consequence of the substitution of the electro-chemical process, or of any treatment by the humid way, for the Mexican amalgamation, might produce a reaction not very favorable to the new method, since this diminution of price would induce a return to the old system.

The present price of salt in Mexico is an obstacle, not that this agent is decomposed in the operation, but on account of the mechanical losses inevitable in the manipulation. This loss, on account of the masses operated on, represents a high cipher to be put in comparison with the economy of mercury; but this cipher may be reduced by the employment of apparatus destined to collect the salt which remains in the metallic dross. The material demands in general a very considerable expense, which no company has hitherto wished to incur, in order to compare, on a very large scale, the cost of electro-chemical treatment with that of amalgamation. But if, in consequence of the improvements made in the saline springs of *Penon blanco*, the salt could be furnished at a moderate price, the electro-chemical process, in M. Duport's opinion, would certainly be employed, since the loss of the salt in the *bones* might then be neglected. Thus he is convinced that if mercury were to fail, this process would insure the existence of the mines of Mexico.

M. Duport has not neglected to speak of the attempts made to diminish the loss of mercury, by employing amalgams of various metals more oxidisable than mercury. By employing, as at Chili, the copper amalgam at Guadalupe y Calvo, good results were obtained by a process due to a German metallurgist, named Lukner. M. Duport also gives the detail of experiments made by Macintosh and Buchan, in order to treat, by means of this amalgam, the ores of silver without previous preparation, in barrels similar to those of Freyberg.

The Academy can convince itself that M. Duport has attacked in his work all the questions relative to the production of silver in Mexico; that he has treated of them in a manner which makes known to us its present state, and its chances of augmentation or diminution; that, by his investigations concerning the theory of amalgamation, he has pointed out to chemists the course to be pursued in order to improve the metallurgy of silver, and that he has brought into all his discussions the justice and precision of a mind habituated to great industrial combinations; he gives proof, at the same time, of varied knowledge of the sciences connected with metallurgy.

We propose to the Academy to thank the author for the important documents which he has presented to it, and to be good enough to take care that they be communicated to the Ministers of Commerce and Finance, on account of the considerations of political economy which terminate the work, and which are of great importance to our commercial relations, and especially to our monetary system.

Your committee expresses at the same time the wish that M. Duport will make known to the Academy, as soon as his experiments have terminated, the results which he has already obtained, and those which he will obtain in the work which he has undertaken in the improvements in the Mexican treatment of silver ores.

The conclusions of this Report were adopted by the Academy.

MEANS OF COMMUNICATING TO FECULA, WITHOUT THE ASSISTANCE OF TORREFACTION OR THE ACIDS, THE PROPERTY OF DISSOLVING IN WATER AT 160° FAHR., AND OF RETAINING THIS SOLUBILITY FOR TWELVE MONTHS OR MORE.*

BY M. JACQUELAIN.

A solution of diastase was prepared at 140° F., with 300 *grammes* of pure water, and 80 *grammes* of germinated barley. The filtered solution was then divided into two equal parts, one to be used for moistening 125 *grammes* of fecula dried in the air, the other to be used in a similar way with 125 *grammes* of fecula previously dried at 212° Fahr., in order to facilitate the imbibition of the liquor by the fecula.

An hour after this moistening, each portion was set to drain on blocks of plaster, then their desiccation was terminated in a platinum capsule maintained at 104° F., by the water of a sand-bath.

It is evident that in thus placing the moistened fecula on plaster, I wished to accelerate the flowing of the liquid in excess, and to prevent the alteration of humid diastase which so promptly takes place in contact with the air. These preparations being terminated, it was necessary, on one hand, to ascertain whether fecula impregnated with diastase had acquired the property of dissolving in water at 160° F.; and, on the other hand, if the fecula could long retain this solubility.

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* *Comptes Rendus*, No. 20, May 22, 1843.

The first question has been affirmatively answered, for 5 *grammes* of these two feculas mixed with 30 *grammes* of water, gave a complete and very fluid solution as soon as the water had acquired the temperature of 160° F.

The results were the same when, instead of operating as above, the 5 *grammes* of each fecula were added to 30 *grammes* of water at 140° F.

These experiments, tried on the 25th of March, 1841, were repeated with equal success at the same period of 1842; and when the fecula thus prepared was employed, which had been designedly kept in vessels simply covered with a paper, the solution in water was always obtained. In 1843, these same feculas no longer dissolved in water at 160° F.

From these facts, it evidently results that diastase, a principle which is eminently ephemeral in the isolated state, may nevertheless be transported into fecula, and be preserved in it for some time from the variations of temperature and from atmospheric humidity, just as it is kept in barley, whose desiccation has been suspended by a suitable process.

ON A PROCESS OF MAKING WHITE LEAD, WHICH GREATLY DIMINISHES THE UNHEALTHINESS OF THE WORK.*

BY M. VERSEPUY.

I TAKE the liberty of addressing to the Academy some developements consequent on a communication made on the 22nd of May, 1843, by M. Gannal, concerning a process of manufacturing white lead.

This same process has for five years been the subject of my occupation in my leisure moments, and while about to finish my observations, I read in the journals the announcement of an analogous work on a new means, which should constitute an epoch in the arts. I cannot have any pretension to priority, since a few days' delay has deprived me of that advantage; may I be permitted, in compensation, to deposit with the Academy a summary of the labors which I undertook with a view to the public interest, and thus to add to those already produced, and which I have proved by experience.

The following is the manipulation at which I arrived:—

The lead in lumps, or pieces of pigs, is thrown into a stone cylinder; I employ lava with an equal weight of water. After 12 hours, the metallic pap is removed, in order to its being introduced into an immoveable wooden cask, furnished with two ventilators on its circular part, fitted with eaves to prevent the escape of the liquid. A wooden stirrer, with paddles, was placed in the interior.

A layer of ceruse is formed on the internal surface of the stone cylinder, which prevents it from wearing. This layer of ceruse arises from the deposit which is formed in the intervals of the operations, and serves as a leaven for determining the oxidation of the particles of lead in the ulterior operations.

It is useless to granulate the lead for a regular manufacture.

The water is necessary for detaching the particles of lead as the friction produces them.

The pap should be extracted from the stone cylinder, in order to separate the lead which is not entirely pulverised, and to be able to submit it to violent agitation, so that the surfaces be multiplied *ad infinitum.*

The carbonic acid of the air is alone sufficient for the formation of the carbonate.

I obtained nothing satisfactory from the introduction of carbonic acid by portions, nor even of an entire atmosphere of that acid into the cask, nor by the employment of acetic and nitric acids and their salts.

It is evident that my process is very cheap and easy of execution.

No addition of any body whatever, no chemical agent, complicates the progress of the operation. The mechanical power alone operates the conversion of lead into ceruse.

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[*] *Comptes Rendus*, No. 23, June 12, 1843.

ON MANURES AND THEIR COMPARATIVE VALUES.*

BY MM. BOUSSINGAULT AND PAYEN.

TABLE OF THE ANALYSES AND COMPARATIVE VALUES OF MANURES.

Designation of the Substances.	Normal Water.	Weight of the dry Matter employed.	Nitrogen obtained in Cubic Centimeter.	Temperature.	Pressure.	Nitrogen in the dried Substance.	Nitrogen in the undried Substance.	Value.		Remarks.
								Dried Substance.	Substance in the Normal State.	
		gr.	cc.	°						
Farm-yard dung . . .	79·3	4·0755	66·1	9·2	0·745	1·95	0·40	100	100	
Pea-straw	8·5	0·600	10·0	10·5	0·744	1·95	1·79	100	447·5	
Millet-straw . . .	19·0	0·600	5·0	10·0	0·732	0·96	0·78	49	195	
Buckwheat-straw . . .	11·6	0·500	2·3	9·5	0·745	0·54	0·48	27	120	
Lentil-straw . . .	9·2	0·600	5·7	10·5	0·743	1·12	1·01	57	250	
Wheat-straw . . .	19·5	0·600	1·7	13·6	0·747	0·30	0·24	15	60	
Idem . . .	5·3	0·555	2·5	16·0	0·762	0·53	0·49	27·1	122·5	Old, 1840, environs of Paris.
Idem . . .	5·3	0·723	2·8	16·5	0·764	0·43	0·41	22	102·50	Lower part, 0·67 of the length.
Idem . . .	9·4	0·474	5·8	16·0	0·762	0·42	1·33	72·82	332·5	Upper part, the threshed ear included, 0·33 of the length.†
Rye-straw . . .	12·2	0·600	1·2	55·4	0·747	0·20	0·17	10	42·5	
Idem . . .	12·6	0·504	2·2	63·5	0·758	0·50	0·42	25·6	105	Crop of 1841, environs of Paris.
Oat-straw	21·0	0·600	1·8	55·4	0·744	0·36	0·28	18	70	
Barley-straw . . .	11·0	0·600	1·3	58·2	0·750	0·26	0·23	13	57·5	
Husks of wheat . . .	7·6	0·600	5·0	50·9	0·728	0·94	0·85	48	212·5	
Dried stalks of the artichoke .	12·9	3·354	1·3	55·4	0·746	0·43	0·37	22	92·5	
Leaves of madia . . .	14·3	0·860	2·0	61·3	0·767	0·66	0·57	33	142·5	
Grass of a natural meadow .	87·5	0·654	27·5	54·78	0·763	0·29	0·53	220	132·5	Graminaceæ.
Broom	10·4	0·531	6·2	62·9	0·794	1·37	1·22	70	305	Stalks and leaves.
Leaves of beet-root . .	88·9	0·500	19·0	45·5	0·745	4·50	0·50	230	125	
Potato leaves . . .	76·0	0·476	9·5	50·0	0·745	2·30	0·55	117	137·5	Leaves of the crop.

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* *Annales de Chimie.*

Leaves of carrots	70·9	0·600	15·3	49·1	0·728	2·94	0·85	150	212·5	
Leaves of heath	7·0	1·082	18·0	51·8	0·753	1·90	1·74	97	435	Dried in the air.
Fucus digitatus	39·2	0·788	9·5	56·3	0·755	1·41	0·86	72	215	
Idem	40·0	1·451	19·5	58·2	0·761	1·58	0·95	81	237·5	
Idem saccharinus	40·0	1·170	32·0	55·4	0·755	2·29	1·38	117	345	Dried in the air.
Idem	75·5	,,	,,	,,	,,	,,	0·54	,,	135	On leaving the sea.
Grains	6·0	0·897	38·0	59·9	0·751	4·90	4·51	251	1127·5	
Buried root of clover	9·7	0·638	9·5	50·0	0·746	1·77	1·61	90	402·5	The roots dried in the air.
Cake of linseed	13·4	0·500	25·3	48·2	0·750	6·00	5·20	307	1300	
,, of colza	10·5	0·500	22·7	41·0	0·749	5·50	4·92	282	1230	
,, of arachis	6·6	0·801	52·6	62·6	0·751	8·89	8·33	455	2082·5	
,, of madia	11·2	0·442	22·0	68·0	0·755	5·70	5·06	292	1265	
,, of refinement	10·0	0·455	15·4	62·9	0·755	3·92	3·54	201	885	Of green fats by saw-dust of the poplar.
,, of refinement	7·67	4·246	21·5	67·38	0·767	0·58	0·54	30	135	Of fish oil by the saw-dust of the poplar.‡
Seeds of white lupin	10·5	0·806	27·6	55·13	0·762	4·36	3·49	223	872·5	Boiled and dried, Tuscany.
Grape grounds	48·2	0·6865	19·7	65·3	0·755	3·31	1·71	169	427·5	
Idem	,,	2·055	62·0	62·0	0·768	3·56	1·83	182	457·5	
Pulp of beet-roots	9·3	0·391	4·2	59·0	0·754	1·26	1·14	64	285	Dried in the air.
Idem	70·0	,,	,,	,,	,,	,,	0·378	64	85	On leaving the press.
Idem of potatoes	73·0	1·130	19·0	64·4	0·7635	1·95	0·526	100	131·5	Pressed.
Juice of potatoes	95·4	0·373	26·5	63·78	0·7635	8·28	0·376	424·6	94	Left to settle for 4 hours and decanted.
Water from starch manufactories	99·15	,,	,,	,,	,,	8·28	0·070	424·6	17·5	Washing with 4 volumes of water.
Idem	99·25	,,	,,	,,	,,	8·28	0·062	424·6	15·5	Washing with 5 volumes of water.
Deposits of the waters of starch manufactories	80·0	0·759	18·0	66·2	0·757	1·81	0·36	92	90	Drained in heaps.
Idem	99·25	,,	,,	,,	,,	1·81	1·538	92	384·5	Dried in the air.
Waters from dung-hills	99·6	0·651	20·0	55·4	0·768	1·54	0·059	78	1·475	Washing, the rain of a year.
Saw-dust of acacia wood	25·0	0·755	2·5	55·4	0·735	0·38	0·29	19	72·5	Dried in the air.
Idem	25·0	1·021	2·75	64·4	0·762	0·31	0·23	15	57·5	*Id.*
Saw-dust of fir	24·0	1·098	2·0	58·2	0·767	0·22	0·16	11	40	*Id.*
Idem	24·0	1·168	3·0	50·9	0·760	0·31	0·23	15	57·5	*Id.*
Idem, of oak	26·0	1·485	9·0	44·6	0·759	0·72	0·54	36	131	*Id.*
Solid excrements of cows	85·9	1·077	21·0	55·5	0·741	2·30	0·32	117	80	
Urine of cows	88·3	1·173	39·0	60·9	0·736	3·80	0·44	194	110	

Designation of the Substances.	Normal Water.	Weight of the dry Matter employed.	Nitrogen obtained in Cubic Centimeters.	Temperature.	Pressure.	Nitrogen in the dried Substance.	Nitrogen in the undried Substance.	Value.		Remarks.
								Dried Substance.	Substance in the Normal State.	
		gr.	cc.	°	m					
Mixed excrements of cows	84·3	,,	,,	,,	,,	2·59	0·41	132	102·5	Calculated result.
Solid excrements of the horse	75·3	1·126	21·0	53·6	0·755	2·21	0·55	113	137·5	
Urine of the horse	79·1	1·218	126·2	55·3	0·766	12·50	2·61	641	652·5	The horse drank very little.
Mixed excrements of the horse	75·4	,,	,,	,,	,,	3·22	0·74	154	185	The urine very thick.
Excrements of pigs	81·4	0·995	29·3	68·0	0·754	3·37	0·63	172	157·5	
Idem of sheep	63·0	0·890	23·0	67·6	0·762	2·99	1·11	153	277·5	
Idem of goats	46·0	0·873	29·0	64·4	0·764	3·93	2·16	101	540	
Pigeon's dung	9·6	0·8335	64·8	61·3	0·765	9·02	8·30	462	2075	Bechelbronn.
Liquid Flemish manure	,,	3·671	5·8	59·5	0·756	,,	0·19	,,	47·5	Analysed in the normal state.
Idem	,,	2·871	5·5	58·4	0·754	,,	0·22	,,	55	*Id.*
Poudrette of Belloni	12·5	0·927	34·0	51·8	0·762	4·40	3·85	225	962·5	Dried in the air.
Idem of Montfaucon	41·4	1·937	45·0	66·2	0·760	2·67	1·66	137	390	
Oyster shells	17·9	1·995	6·8	55·4	0·751	0·40	0·32	20	80	
Goëmon called *burnt*	3·8	0·864	3·0	66·2	0·753	0·40	0·38	20	95	
Soot from coals	15·6	0·685	8·1	65·3	0·763	1·59	1·35	81	337·5	
Idem from wood	5·6	0·650	7·4	67·6	0·755	1·31	1·15	67	287·5	
Mud of the river Morlaix	3·7	0·965	3·5	65·3	0·752	0·42	0·40	21	100	
Sand of the Bay of Roscoff	0·5	0·791	0·9	62·7	0·767	0·14	6·13	7	32·5	Sea-sand.
Marl	1·038	0·598	25·0	65·3	0·763	0·517	9·512	26·5	128	*Idem.*
Picardy ashes	9·2	0·491	3·0	59·0	0·765	0·71	0·65	36	162·5	Dried in the air.
Dry muscular flesh	8·5	0·422	52·0	62·6	0·757	14·25	13·04	730	3260·0	Dried in the air.
Salt fish	38·0	0·6767	64·0	68·0	0·7625	10·862	6·700	557·0	1675·0	Water and salt.
Washed fish, pressed	10·0	0·49	80·50	66·2	0·7675	18·74	15·86	961	4215·0	Dried in the air.
Dry blood, soluble	21·43	0·38	42·5	64·4	0·763	15·503	12·18	795	3045·0	As sent out.
Liquid blood	81·10	,,	,,	,,	,,	,,	2·945	795	736	Of the slaughter-houses.
Idem	82·5	,,	,,	,,	,,	,,	2·712	795	580	Of horses.
Blood, coagulated and pressed	73·45	0·316	47·25	71·8	0·7625	17	4·514	871	1128·5	On leaving the press.
Idem, dry and insoluble	12·5	,,	,,	,,	,,	17	14·875	871	3719·0	Dried in large quantity.

Feathers	12·9	0·64	9·6	59·0	0·755	17·61	15·34	903	3835·0	
Hair of oxen	8·9	0·180	23·4	59·3	0·750	15·12	13·78	775	3445·0	
Woollen rags	11·28	0·267	46·5	65·3	0·763	20·26	17·978	1038·9	4494·7	
Raspings of horn	8·0	0·184	25·1	62·9	0·752	15·78	14·36	809	3590	
Cockchafers	77·0	0·607	74·0	69·8	0·7625	13·931	3·204	714·4	801·0	
Burnt bones	7·49	0·473	30·5	62·15	0·765	7·38	7·016	3·88	1754·0	Dried in the air.
Humid bones	30·0	,,	,,	,,	,,	,,	5·306	,,	1326·5	Sold by the burners.
Greasy bones	8·0	,,	,,	,,	,,	,,	6·215	,,	1553·75	Containing 0·10 of fat.
Residue of glue	42·0	4·860	38·5	67·59	0·75	80·912	0·528	46·7	133	
Grounds of size	33·61	0·876	43·0	65·30	0·754	5·625	3·734	288·4	933·5	Sold by the manufacturers.
Cake of greaves	8·18	0·523	58·50	62·6	0·757	12·934	11·875	663·2	2968·75	
Animal black of the refineries	47·7	1·046	11·0	59·0	0·767	2·04	1·06	104	265	As sent out.
Animalised black	44·6	2·742	46·25	65·30	0·764	1·96	1·090	100·5	272·5	Prepared 11 months.
Black of the fields	42·0	1·963	50·0	65·30	0·764	2·958	1·242	151·5	310·5	Recently manufactured.

† The ratio in weight of the 0·67 of length in the inferior part to the 0·33 in the upper part is as 93 to 23.

‡ Name of the household fats collected in large towns by the melters of bone fat.

⁂ We are constrained to postpone the Synoptical Table of the equivalents of different manures, concluding this article, until next month.

ON A NEW PROCESS OF MAKING WHITE LEAD, BY MEANS OF WHICH THE HEALTH OF THE WORKMEN IS NOT INJURED.*

BY M. GANNAL.

In conclusion, says the author, in terminating his Memoir, my process of manufacture consists :

1st. In granulating the lead :

2nd. In dividing it indefinitely, by rubbing it on itself in a leaden cylinder :

3rd. In facilitating the oxidation of the divided lead by the introduction of atmospheric air into the apparatus.

4th. In immediately converting this oxide of lead into the carbonate, by employing air more charged with carbonic acid :

5th. In hastening the oxidation of the lead, by introducing into the apparatus some nitric acid, or nitrate of lead :

6th. In washing the product obtained by this process :

7th. In hastening its desiccation, by submitting the result to strong pressure :

8th. In dividing into square cakes the pressed paste :

9th. In drying the divided product in a stove with a current of heated air.

FANSHAWE'S PATENT ELASTIC PAVEMENT.

We are indebted to Messrs. Ancona and Bagster, the well known architects and surveyors, whose names alone are sufficient guarantee of the respectability of the undertaking which we are about to notice, for the means of giving our readers a brief account of the advantages attending the adoption of this excellent material for the construction of pavements.

It is composed of caoutchouc, combined, by mechanical means, with other suitable materials, by a method for which Her Majesty's Letters Patent have been granted to Mr. H. R. Fanshawe, a gentleman whose inventive genius has frequently brought his name honorably before the public. To carry out this patent, a company has been formed. This composition constitutes a firm, substantial, and elastic pavement ; we understand that the most severe tests of pressure, and wear and tear, have been applied to it, without the slightest injury, and we have no hesitation in publicly testifying to its great and indisputable superiority.

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* *Comptes Rendus*, No. 20, May 22, 1843.

We gather from the company's prospectus, the following statement of the applicability of this pavement:—

Caoutchouc forms the best material that has hitherto been applied to the paving of stables, court-yards, basements and footpaths; for preventing the escape of the highly deleterious effluvia from the vaults of churches or other buildings exposed to the action of noxious gases; for preventing the noise which, in large rooms devoted to religious or civil assemblies, is found so serious an inconvenience; for prisons, hospitals, asylums, &c., where the prevention of damp is so essentially necessary for the preservation of health; for sea and wharf walls; for a protective covering to piles, especially where they are likely to be destroyed by the worm; and for rendering roofs, arches, vaults, &c. impervious to moisture.

Rats and other vermin cannot penetrate it; therefore it is well adapted for the floors and walls of granaries and malthouses. For stables it also offers very considerable advantages. Its resistance of humidity, its elasticity and softness, and its non-liability to fracture (like the materials now employed), are valuable qualities, of which every one possessing a horse would do well to avail himself.

If the pavement of the stable be properly inclined, so that the urine may run into a surface-drain, and if a pail or two of water be thrown over it daily, in order to remove any urine that may remain on it, and if the water be quickly removed with a brush or broom into the main surface drain, there will no longer be any necessity for sub-drains; and there will be no injury to the horses' eyes, from the ammoniacal vapor resulting from the spontaneous decomposition of the urine.

It is very well applied to the flooring of lunatic asylums, as the patients very frequently dash their heads against the ground, and this elastic substance will not hurt them.

It has occurred to us that it would form an excellent flooring for laboratories and shops; and that the thin material might advantageously be applied to all the purposes for which floor-cloth is now used. Indeed, we think that the thick pavement would be an excellent substitute for the boards used for the floors of dwellings, &c. Among other benefits arising from this substitution, would be the impossibility of rats and other vermin making their way through it.

We should say, that, from its noiselessness, it would be extremely well applied to the paving of churches, concert rooms, theatres, and the New Houses of Parliament.

It has been laid down in the stables of the Royal Horse Guards Barracks, Knightsbridge, the Royal Artillery Barracks, Woolwich, and we understand that the stables of the Barracks at Winchester are about to be paved with it.

FEEDING OF HORSES. DOCUMENTS IN SUPPORT OF THE VERBAL REPLY OF M. PAYEN TO M. MAGENDIE.*

The Academy will permit me to submit to it some clear and positive explanations and proofs in support of the answer which I verbally returned to the objections made by my learned colleague and friend, at the last sitting. And first, I may mention that, at the period when, at the kind request of M. Magendie, I was nominated a Member of the Commission of the *Amirault*, the absence of M. Boussingault had especially induced this adjunction; no responsibility can therefore devolve on him relative to the experiments undertaken by the Commission.

But I hasten to say that the facts proved by our *confrère* (Boussingault), in Alsatia, and without any communication on the subject having taken place, are perfectly in accordance with the results which I have communicated to the commission, and deposited in the hands of M. Magendie, our president.

This confirmation, obtained by works completely isolated and independent, is of a nature to inspire confidence: it may therefore be believed, that at Bechelbronn, as at Paris, the fatty substance is more abundant in the aliments with which horses are fed, than in their excrements.

It seems to us also true, that it is evident that at Giessen, as in France, and as in every country, the fruits of the graminaceæ, and of the cereals in particular, are organised in such a manner as always to present an oleaginous secretion near the surface of their pericarp and in the whole mass of their cotyledon.

That thus, neither the experiments of the commission, nor those of M. Boussingault, any more than the laws of vegetable physiology, could afford the slightest support to the ingenious hypothesis of the clever chemist of Giessen.

M. Magendie had in his hands all the documents proper for establishing and justifying the conclusions of our experiments. I was obliged to remit them to him, but it was permitted to me to keep an extract of them, and I am naturally warranted in depositing in the *Bureau* of the Academy, the first part of these documents, which relates to the question discussed last Monday.

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* *Comptes Rendus*, No. 11; *Sitting of the Academy of Sciences*, March 13, 1843.

There will be remarked in it, a series of synoptical tables and successive observations, the first facts laid down, concerning the weight and condition of horses before and after certain alimentary regimens; the composition of the provenders and drinks; the comparative proportions of inorganic and organic substances in the aliments and in each of the dejections; the quantities of the aliments consumed; the analysis of the solid excrements and of the urine passed; the reaction of the latter; the influence of regimen on healthy horses, and on horses affected with glanders; the proportions of fibrin in their blood, &c. &c.

Doubtless much patience and labor will be required in order to arrive at definitive conclusions concerning these various points: the presence of M. Boussingault, and the unanimous concurrence of the members of the commission, will sustain our perseverance; but from this time, and in the interest of the part of the work which was entrusted to me, I ought especially to avoid consequences contrary to the observations getting abroad, and being accredited.

I am therefore obliged to set forth the facts as they have been given in our tables, and the notes at the conclusion of the analyses.

The following is what is in reality met with in these pieces.

Two horses weighing together 940 *kilogrammes*, submitted to feeding exclusively with hay, consumed in fourteen days 332 *kil.* of this provender, containing $6^{kil}\cdot640$ of fatty matter; they rejected in 226 kilogr. of excrements, $3^{kil}\cdot672$ of substance soluble in ether; that is to say, $2^{kil}\cdot968$ less than their provender contained; moreover, the weight of each of the horses, instead of having increased, as M. Magendie thought, had really diminished—one 13 kilogr., the other 25; or 38 kilogr. the two.

These results are in perfect harmony with the observations made by MM. Dumas and Boussingault, and myself, both separately and together: they are then far from shaking our conviction; they have, in a word, a signification precisely contrary to that which remained on the mind of M. Magendie.

In reading yesterday, in the *Comptes Rendus*, the reply of our *confrère*, I found in it numerical indications which were not given at the sitting, to which I am obliged to reply; they coincide neither with the ciphers, nor with the conclusions of the work undertaken by the Commission.

If M. Magendie had examined the comparison ready made on the third table of the same page, the illusions would have dissipated of themselves, for, in the fourth column of the consumption, we find, for one of the horses, $2^{kil}\cdot95$ of fatty matter of hay, corresponding to $1^{kil}\cdot92$ and $1^{kil}\cdot69$ of fatty matter rejected by the excrements; if, indeed, our *confrère* had taken the time to read the observations in the second page, he would have been completely satisfied as to the harmony which exists among all our results, by reading the following passage, which I have extracted verbatim, for notes intended for ulterior consideration:—

"The fatty matter found in the dung of horses eating hay alone, is about two-thirds of that contained in the hay."

If, therefore, there have been too much precipitation in this affair, it is evidently not on our side.

Since the period when my notes were first communicated to the commission, and left in the hands of our president, new facts have been collected for the same work, and if they were calculated to support the truth of the assertion, the first basis of which I have just removed, it would be my duty here to admit it; but it is quite otherwise.

Having remarked, that by means of a more complete mechanical division, a greater quantity of fatty matter may be extracted from the provenders, I repeated the first analysis with M. Poinsot, a young chemist, to whose care and accuracy I am happy to testify.

MM. Schmersahl and Berlioz were kind enough, at my request, to undertake some verifications on so important a subject, with their accustomed accuracy.

All these analyses also produced results agreeing with each other; I have here extracted only the data which are applicable to the controverted question.

It will readily be understood, that after the triturations exercised by the teeth and viscera of the animal, the residues of digestion, dried, ground in a mortar and submitted to the usual analysis, yielded nothing more by the effect of a new bruising, whilst the provender retained, in the portions of the vegetable tissues which were not lacerated, the enveloped fatty matter protected from the action of the solvents.

It is not astonishing, then, that the new means employed should have disengaged from the same hay 4·2 per cent. of its weight of adipose matter, instead of 2, which was at first extracted.

If this result be now introduced into the discussion of the facts debated, it will be seen that the 332 kilogr. of provender consumed, contained $13^{kil}\cdot944$ of fatty substance, of which 3^{kil} 640, or only about one-fourth, are found in the residues of digestion.

We have detected, moreover, the presence of minute quantities of a volatile, crystallisable, fatty acid, and of an oily matter, in the urine passed by these horses: in taking account of these two substances, it would be necessary to add 127 grammes to the quantities excreted, which would cause no change in our conclusions.

A curious result of our last analysis indicated that straw, in the alimentation of horses, gives rise to a much less loss by the dejections, than hay,—a phenomenon which would coincide with the maintenance of horses in the best condition; it would also be in accordance with the practical observations concerning the advantages of this nourishment, and with our general theory of nutrition.

I should be fearful, in giving longer details, of trespassing on the attention of the Academy.

I request permission to express, in conclusion, my opinion concerning the discussion which has just been opened. Nothing more fortunate for our work could happen, I think, than an animated controversy, established by the friends of science, and which proves, at least, that this Memoir contains some new things; if, in the end, we are able to remove, one by one, all the serious objections; if we continue thus to inspire agriculturists with the desire of submitting our observations to the control of large applications, and of testing their accuracy; we shall be able, doubtless, to reckon on the assent of those who will have incited us to undertake new verifications; then also we shall have given complete satisfaction to our learned *confrère*, one of the founders of experimental physiology, to whom his own successes have given the right of being a little difficult.

M. Magendie replied: No one will suppose, I hope, that I contradict for the pleasure of doing so. If I indulged in some observations on the important work of my honorable brethren, it was because I thought them well founded, and of a nature to be submitted to them. If I am mistaken in the appreciation of certain parts of the table of which M. Payen speaks, I am ready to own it. I am so much the more disposed to do so, as having been prepared under the eye of our colleague, this table must be more familiar to him than to me.

My calculation has been based on the result given by this table: I have admitted 2 per cent. of fatty matter in dry hay, and 6·5 per cent. in the dry matter of the dung; I afterwards compared the weights of the hay and of the dung, and it is after this comparison that I have fixed my cipher. I will revise the table according to the indications which have just been given. I regret that M. Payen did not communicate them to me before the sitting, for if I had ascertained that they were just, I would have saved him the trouble of refuting my statement, by refuting it myself, according to the example which he has just set us. He informs us, indeed, that hay is no longer found to contain only 2 per cent. of fatty matter, as stated in the table quoted, but in fact 4·2 per cent. Such rectifications do honor to the philosopher, and profit science.

However, this conflict would not have been raised, if our honorable colleagues had taken the trouble to notice, in their Memoir, the quantity of fatty matter which the dejections contain,—a question which is very naturally raised by the letter of Professor Liebig.

I should say, in conclusion, that the point here controverted, although a very small part of what our brethren call their theory of nutrition, requires to be elucidated by a special discussion, as M. Payen has just expressed his desire.

M. Payen observed that, in the table in question, the results of three different regimens are given: the first of hay, the second of straw, the third of oats; that by adding all the numbers relative to these three sources of alimentation, comparable data could not be arrived at, at least taking account of the special compositions of every aliment and of each of the dejections.

He added that, finding in M. Magendie's reply the hope of an attractive discussion of the phenomena of digestion within the limits of scientific investigations, it is with the greatest pleasure that he accepted the augury of it.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

THE FINANCIAL STATEMENT OF THE COUNCIL OF THE PHARMACEUTICAL SOCIETY.

It appears, from the Financial Statement made by the Council of the Pharmaceutical Society, for the eight months ending in December 1842, (instead of being carried on for 12 months, as it ought to have been, a piece of manœuvre arising from motives *known* only to themselves, and at which other people can only *guess*,) that, of 4187*l.* 16*s.* 8*d.* expended during that period, the sum of 1838*l.* 2*s.* was invested in government securities, as follows:—

	£	*s.*	*d.*
Investment of life members' subscriptions, 3 per cent. Consols, 316*l.* 11*s.* cost	294	0	0
Investment on account of benevolent fund, 3 per cent. Consols, Stock 579*l.* 2*s.* 3*d.*	537	17	0
Purchase of 1000*l.* 3½ Reduced	1005	5	0
	£1838	2	0

Thus, it will be seen, that the total expenditure, exclusive of these investments, amounts to 2349*l.* 14*s.* 8*d.*

The *Pharmaceutical Journal* cost 1050*l.* with 28*l.* 10*s.* 3*d.* for delivery of the same, making 1078*l.* 10*s.* 3*d.* If this sum be deducted from the above-mentioned 2349*l.* 14*s.* 8*d.*, we shall obtain 1271*l.* 4*s.* 5*d.*, the total amount of expenditure necessary to the maintenance of the establishment, such as rent (3 quarters, at 240*l.* per annum); 3 quarters' secretary's salary, at 150*l.* per annum; 100*l.* for lecturers; 43*l.* odd for taxes; 77*l.* for servants' wages; 117*l.* for engraving, including balance on account of the diploma, &c. &c.

Now, it must be evident to all, that this sum of 1271*l.* 4*s.* 5*d.* is all that is required for the legitimate purposes of the Society. The Investments, except that of the life members' subscriptions, are perfectly unnecessary. The Journal is quite useless, unless it be to those who wrap bottles and pill-boxes in it—when, alone, it may be said to contain useful matter. If, then, these two items were done away with, the subscriptions might be lowered according to the following plan:—

	£	*s.*	*d.*
408*London members at £1 10*s.* each per annum	612	0	0
1250 country members at 10*s.*	625	0	0
2313 associates at 5*s.*	578	5	0
	£1815	5	0

By this plan the Society would obtain considerably more than sufficient to defray the year's expenses, especially when we bear in mind the circumstance, that many heavy items in the eight months' account will not require to be repeated for a long time. Moreover, the Society would very soon gain considerably in numbers, as the reduced subscription would remove one of the chief objections existing among the numerous mass of country druggists, who have not joined it, and who never will do so, while it remains so very high. The Society's income would soon increase so much as to enable it to print annual reports of its transactions, for gratuitous circulation among the members and associates all over Great Britain.

We have given some outline of a plan, which, in our opinion, would establish the Society on a firm basis, but we know that it cuts at the individual interest of certain persons connected with the Society; and, consequently, there is no prospect of its adoption.

We shall at all times be glad to see such improvements in the management of the Society as will be advantageous to the main body of the trade; but, as at present conducted, it shall have nothing but our most uncompromising opposition, for we feel that to uphold it would be treason to those whose interests we are pledged to support, and have earnestly maintained for nearly four years.

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* We have here adopted the numbers as given in the Report of the Council, and in the last published list of the members.

PREFACE TO THE PHARMACEUTICAL JOURNAL.

The Second Volume of the *Pharmaceutical Budget*, which is just completed, is preceded by a preface, written with all the inelegance common to Mr. Bell's literary productions, a few extracts from which we have selected for the amusement of our readers:—

"The original design of this Journal was merely to establish a medium of communication *in* which information might be conveyed to all parts of the country respecting the transactions which were taking place among the pharmaceutical chemists in the metropolis." We should like to know whether the country druggists derive any satisfaction from learning, through this medium, the extent to which the metropolitan members of the trade are benefited by their subscriptions; if they do, it were a pity to deprive them of the only satisfaction they get for their money.

"To this periodical stimulus may be attributed, in some measure, the success and progress of the Society, to the welfare of which the pages of this Journal have been devoted." The pages of the Journal certainly have been devoted to propping up the tottering Society, and to giving rise to false impressions concerning the benefits to be derived from joining it. But the Journal did not dare to uphold the Society against our energetic appeal to the common sense of its members. It *could not* answer our questions to the satisfaction of those who constitute the Society, and, consequently, they were left *unanswered.*

"Some of the most eminent professors of pharmacy and chemistry in this country have encouraged the undertaking by furnishing instructive papers and useful suggestions, by which means the character of the work has been raised, and the editor is enabled, without taking any credit to himself, (magnanimous man, to take no credit where none is due,) to appeal to the names of Thomson, Pereira, Ure, Phillips, Fownes, Donovan and other authorities, as regular contributors." And well they may be; their article manufacturing is paid for, with the exception of one or two whose afticles are worth nothing. These "*most* eminent professors of pharmacy and chemistry in the country," labor not without remuneration. Drs. Thomson and Pereira are men of respectable standing, and ought to be well paid for lending the sanction of their names to a work of such inferior character. Mr. Phillips is a most respectable chemist, and Mr. Donovan is well known.

The editor goes on to state, that a person named Redwood, "continues to assist in the editorial labors of the Journal." We should like to know what Mr. Bell means by "editorial labors." It appears to us, that the labor of writing two or three pages by way of a leading article, and of answering a few correspondents, (for this is all that his Journal requires,) cannot be so very heavy.

We have often stated, and we now reiterate our statement, that the *Pharmaceutical Journal* is a heterogeneous collection of trash, and we assure Mr. Bell that we are by no means daunted by the information that Mr. Redwood aids in its preparation. We know nothing either favorable or prejudicial to Mr. R., but if we are to rate his scientific and literary attainments by the Journal in the editorial labors of which he assists Mr. Bell, we shall be constrained to form a very poor opinion of them. We are anxious to abstain from censuring any one without sufficient warranty for doing so; but if we are to believe Mr. Bell's accusation, and in this case, perhaps, he may have told the truth in order to screen himself from responsibility, we must suppose that Mr. Redwood is as unlearned in science and the English language as his fellow editor and accuser.

Mr. Bell has evidently arrayed the above names against us as a kind of refutation of our strictures on the character of this Journal, but as we cannot think nonsense any the more tolerable, because written by Mr. Redwood instead of Mr. Bell, we are compelled to stand by our oft-repeated statements.

MR. JACOB BELL'S ANSWERS TO HIS CORRESPONDENTS.

"Nothing extenuate, nor aught set down in malice."

To the Editors of The Chemist.

Gentlemen,—

Enclosed I send you a curious specimen of the kindness and ability displayed in answering the questions of Associates, by the scientific (?) and *learned* editor of the *Pharmaceutical Transactions.* In the first place you will notice that but few of the queries are answered at all, while others are met with a flippancy insulting to a poor fellow, who has managed, by dint of saving, to subscribe his fee—and remind one of the laughable witticisms of Punch. Thus, you will observe, "JUVENIS" asks how pil. galban. co., can be kept soft? Now, mark the working of a mighty genius in replying. By making it in small quantities, and frequently"—so Punch says, the way to kill bugs is—to catch them. Perhaps it did not strike the worthy editor, that the young man was seeking information, or he would have advised the softening of the mass by heating the mortar, and the addition of a small quantity of rectified spirit.

Again, "A.B." who has just joined the Society, wishes for the first six numbers of the *Transactions*, at a reduced rate, and is impertinently told he may "have them gratis, by paying his subscription for the year 1841." A country associate desires the insertion of the questions proposed at the Examination at Bloomsbury Square—alas! alas!—the country associate is doomed to meet with what might have been expected. Did he think that the Examiners would exhibit their scientific attainments in a tabular form, to the gaze of the Society at large?—Verily not; he may depend on one thing, however, that a moderate knowledge of Chemistry, Botany, &c., will be more than enough to terrify the Examiners themselves—(providing they are selected from the Council,) who occasionally analyse by conception (see page 442, bottom lines), thinking it is this or that, colored by some other uncertainty.

You may insert the above in your Journal if you think fit, and allow me to remain,

Your most obedient Servant,

M.P.S.G.B. *pro tem.*

ON THE USE OF MALT LIQUORS.

To the Editors of The Chemist.

GENTLEMEN,—

I am again drawn from my peaceful retirement to advocate the moderate use of malt liquors as drinks; and allow me to commence the few observations that I have to make by stating that I am indeed happy to learn that your correspondent is a *laughing* philosopher.

After the remarks made by yourselves, I shall not venture to hurl back any odium "VIRTUTAS" may have attempted to cast on me; but, perhaps, I may be permitted to say that the letter to which I am now called upon to reply, is very unlike his former one, and that it contains at any rate an attempt at argument; whereas the other contained nothing but bare assertions; but that these arguments are not based on so firm a foundation as your correspondent would have us believe, it will be my endeavor to prove, then leaving the matter in the hands of your readers to judge between us. To this end it is necessary that I should commence by quoting a portion of his second paragraph. He says—"The composition of alcohol shows it at once to be incapable of supplying the animal economy with any particle of nourishment, since it is incontrovertibly proved that animals can derive no support if kept upon substances destitute of nitrogen." To a certain extent this is true; but whoever proposed that men should live on alcohol? Of how many aliments do we partake which not only resemble alcohol in the deficiency of nitrogen, but are closely allied to it in the proportion of carbon, oxygen, and hydrogen, which they contain. I allude to feculent substances, sugar, *cum multis aliis:* all the arguments (if the term may be applied to them), your correspondent has made use of against fermented liquors, apply with equal force to them; and who has found that such substances are, as your correspondent would lead us to imagine, hurtful articles of food? Behold the stout, sturdy-built follower of the plough, with his handful of fat bacon, in which no lean can be seen save by the use of the oxyhydrogen microscope! Does *he* prove that substances destitute of nitrogen exhaust the system? Let it not for a moment be imagined that I am unaware of the importance of nitrogen in the animal economy—this fact is established beyond the possibility of doubt.

It must be borne in mind that I am not advocating the use of *ardent spirits* but of malt liquors; and from numerous analyses of them which I have performed, I know that they contain not only the nutritive extractive matters of malt, and the fine tonic bitter from the hops, but also salts in a state highly favorable to assimilation, namely, in solution; among not the least important of these I may name the bone-phosphate of lime.

In the same paragraph from which I have already quoted, "VIRTUTAS" says—"alcohol is a stimulant, and surely little need be said of it here." Now in my humble opinion it is *here* that its stimulant effects should be considered. It certainly is amusing to see with what ease and carelessness your correspondent dismisses this, the main part of the subject. To attempt to put down the use of fermented liquors by chemical arguments must be in vain, because the same arguments would apply, with equal force, to other articles of diet recommended by the first physicians of the day, both at home and on the Continent, as well as by the first nations of the earth, from an experience of centuries. The question, therefore, resolves itself into this; are stimulants in *every quantity* and under *all circumstances* injurious? Allow me to dwell, for a moment, on this part of the subject. Common consent, I confess, goes a great way with me. About nine men in ten, perhaps ninety-nine in a hundred, either at or after dinner, partake of some beverage containing alcohol: this is a curious fact, and ought not to be overlooked in a discussion of this kind. It would appear that man, in his civilised state, at that meal requires some stimulant, something capable of adding energy to the vital power, and of stimulating the organs of digestion to action. We should bear in mind, in considering this subject, that his food is not only of a somewhat different kind from that which Nature, with her own hand, originally supplied him, but that it is very differently cured and cooked; and that other additions are made which render stimulants, *in moderate quantities*, not only harmless but necessary. When we consider that the inhabitants of almost every nation on the face of the globe consume coffee, or some substance containing a similar active principle, and then refer to Liebig's views on this subject, I think that we shall confess that general consent is some ground of argument, and that coffee, in the state in which we employ it, is not a *natural beverage*.

In support of what I have stated, I will quote the following from Dr. Pereira's excellent work on Food and Diet. On page 415, he says:—" Considered dietetically, beer possesses a three-fold property;—it quenches thirst; it stimulates, cheers, and if taken in sufficient quantity, intoxicates; and, lastly, it nourishes or strengthens. Its power of appeasing thirst depends on the aqueous ingredient which it contains, assisted somewhat by its acidulous constituent. Its stimulating, cheering, or intoxicating power is derived either wholly or principally from the alcohol which it contains. Lastly, its nutritive or strengthening quality is derived from the sugar, dextrine, and other substances contained in the extract. Moreover, the bitter principle of hops confers on beer tonic properties.

" From these combined qualities beer proves a refreshing and salubrious drink (always presuming that it is used in moderation), and an agreeable and valuable stimulus and support to those who have to undergo much bodily fatigue. When Dr. Franklin asserted that a penny loaf and a pint of water, yielded more nourishment than a pint of beer, it is obvious that he regarded beer merely as a nutriment, and overlooked its stimulating and cheering qualities, of which bread and water are totally devoid.

" It is a popular notion, which has, perhaps, some foundation in fact, that beer has a tendency to promote corpulency. This cannot be the effect of the alcohol which it contains, since it is well known that confirmed spirit-drinkers are usually slender or even emaciated.

" Considered dietetically, beer differs from wine in containing less alcohol, but more nutritive matter; and, in addition, a bitter tonic extractive derived from the hops.

" The practice of taking a moderate quantity of mild malt liquor, of sound quality, at dinner, is, in general, not only unobjectionable, but beneficial. It is especially suited for those who lead an active life, and are engaged in laborious pursuits. For the sedentary and inactive it is less fitted. In the convalescence after lingering diseases, it often proves a most valuable restorative; but in delicate conditions of the stomach, and in relaxation of the bowels, its use should be prohibited. With bilious and dyspeptic individuals it frequently disagrees, and by such, therefore, should be avoided. In plethoric constitutions, especially when there is a tendency to apoplexy, it is objectionable. In some persons it is apt to produce headache, and by such it should be either used sparingly, or totally abstained from.

" There are considerable differences in the dietetical properties of different kinds of malt liquors, to which it is necessary to make allusion.

" *Ale* is prepared with pale malt, and on this account is much lighter colored than porter and stout. The strongest kinds of ale are richer in alcohol, sugar and gum, than any other kinds of malt liquor; but though they thus contain a larger amount of nutritive matter, they are not fitted for ordinary use, on account of their intoxicating and stupifying qualities, and are especially to be avoided in diabetic and dyspeptic cases. On some persons they act as purgatives. The *pale ale*, prepared for the India market, and, therefore, commonly known as the *India pale ale*, is free from these objections. It is carefully fermented, so as to be devoid of all sweetness, or, in other words, to be *dry;* and it contains double the usual quantity of hops: it forms, therefore a most valuable restorative beverage for invalids and convalescents. It is taken with benefit by many persons on whom other kinds of ale act injuriously. For ordinary use at table, the weaker kinds of ale, popularly known as *table ale*, are to be preferred."

I fear, Gentlemen, that I should exhaust the patience of you and your readers, or I would have extracted a few more passages referring to this subject from Dr. Pereira's very valuable work, and which paragraphs entirely concur in all that I have at this time and heretofore stated; but I recommend your correspondent to refer to the work for himself, and I would impress upon his mind, as well as upon the minds of your readers generally, the fact, that I do not advocate the use of *ardent spirits*, but only the *moderate use* of wine and beer, and those of the best quality, and taken within the hours of 12 at noon and 9 o'clock P.M.; and never when the stomach is empty, as in that case there would doubtless be local chemical action on the coats of the stomach, the unfortunate consequences of which I have frequently observed.

Your correspondent has placed me in rather an awkward position, and would almost make it appear that he stands forth the unflinching champion of virtue, and I of vice; for, says he, "I shall never cease to vindicate the claims of total abstinence principles; principles which my opponent admires in theory, but which he has neither the virtue nor moral courage to defend." What I *admire* in theory is, the plan of a man denying himself the most minute portion of anything, under the feeling that, if he takes any, he cannot be satisfied with a moderate portion, but would make a beast of himself, and take more than prudence and decency direct;—such a man should be a member of a total abstinence society.

The man to be held up as an example to his race, is the one who can use things for the purpose for which they were sent, not abuse them, nor on the other hand be carried away by wild freaks or fanaticism, and deny himself the moderate and proper use of things, because some men cannot keep within the bounds of decency, and be guided by common sense.

As regards the want of virtue with which your correspondent charges me, I may state that I am no professor of virtue, and doubtless were I "weighed in the scale" with "VIRTUTAS," "I should be found wanting."

In conclusion I may state, that when I read your correspondent's last letter, I was so much surprised at the difference between it and the former one, that I was almost led to imagine that he had procured the aid of some scientific friend in the composition of the latter.

Hoping that you will excuse the length of this epistle,

I remain, Gentlemen,
Your obedient Servant,
MEDICUS.

ON A PREPARATION SOLD UNDER THE NAME OF SUBNITRATE OF MERCURY, AND EMPLOYED FOR THE PURPOSE OF MAKING THE UNG. HYD. NIT.

BY MR. A. J. COOLEY.

A PREPARATION of mercury, under the form of a yellow powder, having for some time been extensively employed in the manufacture of the above ointment, I was induced a short time since to procure a few samples for examination. The bottles were severally labelled as follows:—

"*Hydrarg. Subnitras.*

Two scruples of the Subnitrate of Mercury mixed with one ounce of simple Cerate makes the Ung. Hydrarg. Nitrat. of the LONDON PHARMACOPŒIA."

Upon perusing the label on the first bottle I examined, I naturally concluded, that a mistake had been made, either by the vender or the printer, as to the quantity of powder to be used, to each ounce of "simple cerate," for the formation of this (novel) Ung. Hyd. Nit., but in this particular I was deceived, for on looking further, I found the whole of the directions precisely the same; in fact, excepting the difference between the names and residences of the manufacturers, the labels were, *verbatim et literatim*, copies of each other.

Now, without any lengthy attempt to show the fraud which is thus committed on the purchaser, and the injury the patient may sustain, by the employment of an ointment so made, let us at once turn to the *London Pharmacopœia*, that facts may speak for themselves:—

1 oz. of quicksilver is there directed to be dissolved in 11 fluid drachms of acid. nitric. (sp. g. 1·500), and the solution to be mixed with—

$$\left.\begin{array}{l}\text{4 oz. of olive oil, and}\\ \text{6 do. lard}\end{array}\right\}\ \text{10 oz. of fatty matter.}$$

Now it will be found, that as the equivalent of mercury is 202, whilst that of nitric acid of specific gravity 1·500, containing, according to Phillips, 25 per cent. of water, or according to Ure, only 20·3, will be either 72·15, or 67·65, as we view it either as a bihydrated or sesquihydrated compound; it is therefore quite *evident*, that a super-salt with a large excess of acid, and not a subnitrate, is produced. The consequence of the mixture of this solution (still hot as directed by the College,) with the melted fat and oil, is the development of violent chemical action, which on subsiding, leaves a beautiful gold-colored ointment, possessing an odor and transparency, which may in vain be attempted to be imitated by the admixture of any *colored pigment*.

The peculiar changes which the metallic solution and the fatty matters undergo, are but imperfectly understood, but it has been generally supposed, that intimate combination takes place—that a nitrate of the peroxide of mercury remains in close connexion with the oil, &c., while the latter are partly oxidised, and elaïdate of the oxide of glycerule, and other new compounds result, and in the newly made ointment a little free acid is also present. That the admixture of *nitric acid, alone*, with lard and oil, produces an active ointment, may be seen in the Ung. Acidi Nitrosi, which is not only very stimulant, but has even been frequently sold by the fraudulent tradesman for the Ung. Hyd. Nit. The difference between the *nitrated ointment of mercury* of the *London Pharmacopœia*, and the ointment of *subnitrate of mercury*, prepared according to the label, must therefore be very great, not only as to its *appearance*, *smell*, and *general properties*, but also as to its actual strength, arguing, merely, from the weight of metal contained in each.

Let us see. One ounce, or 480 grains, of metallic mercury are ordered to every 10 ounces of oil and fat, or 48 grains to every ounce; but on the other hand, we are told, that "two scruples," or 40 grains, of this wonderful subnitrate, will make an ointment of precisely the same *nature*, *strength* and *quality*. But how stands this fact? According to Liebig, and the best authorities, the dinitrate of the peroxide of mercury consists of—

$$2HgO_2 + NO_5,$$

or 2 proportions of oxide to 1 of acid: now, as the equivalent of the base is—

$$202 + 16 = 218,$$

and that of nitric acid, (in combination,) is,

$$14{\cdot}15 + 40 = 54{\cdot}15,$$

on the same scale, we have therefore,

$$2HgO_2 = 436 + NO_5 = 54{\cdot}15 = 490{\cdot}15,$$

as the equivalent of the subnitrate, or about 82½ per cent. of metal: it is thus very plain, that the said 2 scruples, or 40 grains, do not contain more than 33 grains of mercury, presuming it to be a pure dinitrate,* which is taking the fairest view of the question. It may, therefore, I think, be fairly concluded, that the dispensing chemist is not justified in using an ointment made with the yellow powder we have examined, when the Ung. Hyd. Nit. is ordered, as the former possesses the quantity neither of mercury nor of nitric acid employed in the preparation of the latter, besides wanting many of its most sensible and valuable properties.

ADULTERATION OF SULPHATE OF POTASSA.

Two or three cases have been recently published in the medical Journals of the Continent, in which the sulphate of potassa, prescribed to nursing women, has proved fatal, after causing a singular series of symptoms. M. Moritz of Neufbrisach, after briefly alluding to another case, in which this salt induced very serious symptoms, states that on examination he found it contained a notable quantity of the sulphate of zinc. He observes that the sulphate of potassa of commerce sometimes contains zinc, while other specimens contain both zinc and copper. The sophisticated salt is procured from Germany, where it is the secondary product of the manufacture of nitric acid, in which the sulphate of iron has been substituted for sulphuric acid. The ferruginous salt contains a variable quantity of zinc, copper, &c., according to the sulphurets from which it has been procured. Chemists purchasing this salt, therefore, instead of preparing it themselves, should examine and purify it.

GALLIC ACID IN MENORRHAGIA.*

Professor Simpson stated, that for the last year he had employed gallic acid in some cases of menorrhagia, with the most successful results. Like all the other remedies directed against that disease, it had also occasionally failed in his hands. Some of the cases which had completely yielded under its use, were of an old standing, and aggravating description. He gave it during the intervals, as well as during the discharge, in doses of from ten to twenty grains per day, made into pills. It had this advantage over most other anti-hemorrhagic medicines, that it had no constipating effect upon the bowels. He was first induced to use it, from finding a case of very obstinate menorrhagia get well under the use of Ruspini's styptic, after many other remedies had utterly failed, and from it being alleged that gallic acid was the active ingredient in that styptic. He suggested whether the anti-hemorrhagic properties of some of our common astringent drugs may not depend upon the gallic acid as much or more than upon the tannin which they contain, or upon the tannin becoming changed into gallic acid within the body.

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* In one sample, especially, this was not the case; it consisted of a mixture of pernitrate of mercury, dinitrate of mercury, and a little oxide in no atomic proportion, being apparently a mere solution of metal in excess of acid, evaporated and afterwards heated till it turned yellow. This powder consequently contained less mercury than above mentioned.

* *London and Edinburgh Monthly Journal of Medical Science*, July, 1843.

Dr. Douglas Maclaclan mentioned, that in one case where he had tried it without success, it had acted as a diuretic.

EFFECTS OF HYDROCYANIC ACID IN A POISONOUS, BUT NOT IMMEDIATELY FATAL DOSE.*

BY DR. JG. HAYN.

A HYPOCHONDRIACAL gentleman, well advanced in years, one morning swallowed an ounce and a half of cherry-laurel water, which he had long kept by him for the purpose of committing suicide. Symptoms of poisoning did not make their appearance until after the lapse of three hours. When questioned on the cause of his illness, he made no concealment of what he had done. The first symptoms were paralysis of the hands and feet, and also of the muscles which support the head, which fell forward on the breast, and could not be raised by the patient. The contents of the bowels and bladder were passed involuntarily. The extremities, though motionless and cold, were not insensible; the pulse was small; the voice hoarse, but distinct. The intellect was perfectly untouched; the patient observed with satisfaction on the continually increasing weakness, and died in the evening calmly, in consequence of paralysis of the muscles of respiration.

DICTAMNUS CRETICUS.†

AT a late meeting of the Medico-Botanical Society, Mr. Bennett described this plant as a native of Candia, perennial, and flowering in July. Of the many properties attributed to it, its emmenagogue, alexipharmic and vulnerary, appear to be the chief. It is used in infusion, or by being smoked. The leaves have an agreeable aromatic smell, and a hot, biting taste, imparting their virtues both to water and spirit. They contain a yellow essential oil, congealing when cold.

ANODYNE POWER OF THE CYNARA.‡

To the Editor of The Lancet.

SIR,—On casually inquiring lately at one of the leading chemist and druggist's in London, whether the *cynara* was often an ingredient in the prescriptions which were brought to his shop, I was much surprised to find that, with only one exception, (which exception proved to be my own,) he had never been called on to prepare it; and as I learned still farther, from him, that he had experienced much difficulty in procuring it on the occasion just stated, the inference of its rarity in London practice was at once evinced. Having frequently prescribed the cynara with very decided success in rheumatic and neuralgic affections, and feeling satisfied, *if the preparation be good*, that it is very deserving of consideration, I venture, through your pages, to recommend it to your readers. I have prescribed it very frequently in private practice, as well as at the dispensary in this town, and have been convinced of its anodyne efficacy, even in some protracted and obstinate cases of sciatica, which had not been relieved by the ordinary remedies. I generally prescribe a combination of a drachm of its tincture with five grains of the extract, in a draught, three times a-day, varying the vehicle, and adding other remedies, according to the circumstances of the case; sometimes in *mist. guaiaci*, one ounce and a half, or *mist. camphoræ;* sometimes in combination with colchicum, and with or without a few drops of Battley's *liquor opii sedativus*, or a solution of morphia. It possesses the advantage of having no deleterious or prejudicial effects on the system, and may be increased in its proportions or duration, if the case require it. Several cases of gout have yielded so rapidly to its exhibition, as to induce a belief in its specific power in the minds of those who have suffered from that complaint.

It is not a new medicine, it is mentioned in Lewis's *Materia Medica*, in Paris, and in Hooper's *Medical Dictionary*, and in other works; but it is merely lauded there for its diuretic property, and said to derive its name "cinara" from *κινέω* (*moveo*), "quia movet urinam," an etymology as vague as it is unsatisfactory; others spell it, "cynara," and derive it from *κύων* (*canis*) from the dog-toothed shape of its leaf. But this is of minor importance. Suffice it to say, that it is universally known under the title of "artichoke." It is necessary that it be prepared quite fresh from the leaves, its efficacy apparently depending mainly on its freshness. I do not feel justified in giving public reference to those who have been cured by it, although I could furnish abundant instances; and Mr. Raker, a highly respectable chemist in Chelmsford, who prepares it himself, and has the very best quality, can bear testimony to the frequent application from different quarters for its supply. I am, Sir,

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* *Hufeland's Journal*, February, 1843; and *Lond. and Edin. Monthly Journ. of Med. Science*, July, 1843.

† *Provincial Medical Journal*, July 8, 1843.

‡ *The Lancet*, July 15, 1843.

Your obedient servant,
J. C. Badeley, M.D.
Chelmsford, July 4, 1843.

CHOREA CURED BY MISTAKE.

Dr. Hildreth, of Zanesville, Ohio, states, that he was informed by a medical friend of undoubted veracity, that he once knew a case of chorea cured in four or five days by mistake. The patient was a mulatto girl, of 17 years of age. Her physician had great confidence in the powers of arsenic in this affection; he therefore prescribed ten drops of Fowler's solution to be taken three times a day. The patient, thinking this dose too small to do any good, took 20 or 30 drops instead of 10. As a matter of course, she was completely poisoned in a very short time, and was obliged to take the proper antidotes for arsenic to save her life. On recovering, however, from the effects of the poison, she was found to be permanently free from all signs of chorea. Dr. Hildreth relies upon large doses of quinine, from 15 to 30 grains in the course of the day, given so as to produce occasional, but not constant, tinnitus aurium, that is to say, pushed so far as to threaten incipient quininism. Judging from its action in the cases in which he has given it, he considers it will shorten much the duration of the disease. If there be evidence of cerebral congestion, or fulness of the vascular system, it should not be given without preparation: the secretion of the stomach and bowels should be rendered healthy, and if anæmia be present, it should be combatted at first by chalybeates.

ANTI-EPILEPTIC PILLS.*

℞ Aqueous extract of opium	5	centigr.
Acetate of lead	20	,,
Powder of hyosciamus	40	,,
Gum syrup	q. s.	

M. and F. S. A., a perfectly homogeneous mass, divided into eight pills of equal size, rolled in powdered orange leaves.

These pills are prescribed by Professor Récamier in cases of epilepsy. He directs one to be taken in the morning, and the other in the evening.

We follow up this formula with that which Dr. Leuret prescribes in the same cases, and of which he has had opportunity of proving the efficacy.

℞ Extract of stramonium	1	gramme.
Extract of belladonna	1	,,
Camphor	50	centigr.
Opium	50	,,

M. and F. S. A., a homogeneous mass, to be divided into pills of 10 decigr.

One of these pills is taken *per diem*, at the commencement, and the dose is progressively increased, according to the effects produced, until it amounts to 15 and even 20 in the course of 24 hours.

ETHEREAL LINIMENT OF OIL OF ERGOT.*

℞ Oil of ergot	4	grammes.
Sulphuric ether	12	,,

Mix and keep it in a well stoppered bottle.

This mixture is very probably more active than the following.

LINIMENT OF OIL OF ERGOT OF RYE.†

℞ Oil of ergot	4	grammes.
Oil of sweet almonds	12	,,

Mix by simple agitation.

PILLS OF OIL OF ERGOT OF RYE.‡

℞ Oil of ergot	1	gramme.
Yolk of egg	1	,,
Powder of mallow	1	,,

M. and F. S. A., a perfectly homogeneous mass, to be divided into 20 pills, which should be silvered.

BAKEWELL'S PATENT APPARATUS.

Mr. Knight has exhibited to us a very ingenious and simple machine for bottling the soda water prepared in the above apparatus.

We have not sufficient space to give a description of this machine; suffice it, therefore, to say, that it is exceedingly easy of management, and that it is admirably suited for its purpose.

By means of the patent apparatus, and the bottling machine, druggists may make their own soda water at a most insignificant expense, and equal in quality to that made by any other plan.

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* *Gazette de Santé.*

* *Journal de Chimie Médicale*, June, 1843.
† *Ibid.*
‡ *Ibid.*

IV. REVIEWS AND NOTICES OF BOOKS.

A TREATISE ON FOOD AND DIET: *with Observations on the Dietetical Regimen suited for Disordered States of the Digestive Organs; and an Account of the Dietaries of some of the principal Metropolitan and other Establishments for Paupers, Lunatics, Criminals, Children, the Sick, &c.* By JONATHAN PEREIRA, M.D., F.R.S. and L.S., &c. &c. &c. London: Longman. Brown, Green and Longmans. 1843. pp. 542.

THE recent investigations concerning nutrition and alimentary matters, and more especially those of Boussingault, Liebig, Dumas and Payen, have so considerably added to our knowledge concerning the mode in which the animal economy avails itself of the alimentary principles placed at its disposal, and of the circumstances of health and disease by which this assimilation of food is modified, that we may consider ourselves in a position to derive practical benefit from the application of the theories to which these investigations have given rise.

In this much to be desired practical application of the theories of the above-named ornaments of science, a work calculated to guide the medical practitioner was much wanted; that want is now supplied by the interesting volume before us, which is well worthy of the author of the best work on Materia Medica and Therapeutics of the age in which he lives.

Good classification, accuracy of description, clearness of expression, extensive reading, and succinctness of detail, combine to be invaluable to the professional, and interesting even to the general reader. It is written in that clear and easy style which characterises Dr. Pereira's writings, and which possesses such charms for those who like scientific books when they are not "too dry."

This Treatise is divided into two parts: the first treating of Foods; the second of Diet.

The first part commences with the classification of food under the terms *Alimentary Principles*, and *Compound Aliments*. The author justly prefers this division to that established by Dr. Prout, which consists in classifying "alimentary principles into the *aqueous*, the *saccharine*, the *albuminous*, and the *oleaginous*;" and he was induced to deviate from this generally admitted classification, from the utter "impossibility of reducing all nutritive principles to these four heads."

In Chapter I. he considers the chemical elements of foods, previous to entering upon the alimentary principles and compound aliments. These chemical elements are 13 in number, namely, carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, iron, chlorine, sodium, calcium, potassium, magnesium and fluorine.

Chapter II. is devoted to the alimentary principles, namely:—The aqueous, the mucilaginous, the saccharine, the amylaceous, the liqueous, the pectinaceous, the acidulous, the alcoholic, the oily, the proteïnaceous, the gelatinous and the saline alimentary principles.

Chapter III. treats of compound aliments, under which Dr. Pereira considers—

I. SOLID ALIMENTS, or ALIMENTS PROPER.
- Sect. 1. Animal Foods.
    - Class I. Mammalia.
    - II. Birds.
    - III. Reptiles.
    - IV. Fishes.
    - V. Crustaceans.
    - VI. Mollusks.
- Sect. 2. Vegetable Foods.
    - Class I. Aliments from flowering plants.
    - II. Aliments from flowerless plants.

II. LIQUID ALIMENTS, or DRINKS. Divided into 7 orders.

III. CONDIMENTS, or SEASONING AGENTS.

Part II.—Chapter I. treats of the digestibility of food; Chap. II. of the nutritive qualities of foods; III. of times of eating; IV. of dietaries; and V. of the dietetical regimen suited for disordered states of the digestive organs.

From Chapter IV. (Part II.) we select the following observations on dietaries, not so much as a specimen of the style of the work, as from the importance and interest of the subject:—

"It will, I think, be generally admitted, that an accurate acquaintance with the quantity and quality of food necessary to the maintenance of human health and life, under different circumstances, is a matter of great interest to every one; but it is more especially so to statesmen, magistrates, naval and military officers, physicians and surgeons, governors of hospitals and other public institutions, and the guardians of the poor. To them are entrusted the care and supervision of the inhabitants of prisons, ships, garrisons, armies, asylums, hospitals, and poor-houses; and on their knowledge or ignorance depends the health or disease —the life or the death—of a considerable portion of the community.

"The Reports of the Inspectors of Prisons have furnished abundant evidence of the errors committed by magistrates, in the dieting of criminals. Debility, diarrhœa, scurvy, and other evils known to be consequences of defective nutriment, have prevailed in many of the prisons of this country to a serious and alarming extent. I am fully aware of the difficulty, in many cases, of determining the cause or causes of these evils, and I am willing to admit that, possibly, in some of the instances in which defective nutriment has alone been charged with the production of diseases of an epidemic character, other morbific causes, either alone or concurrently with defective nutriment, may have contributed to the result. But in some cases the cause of the evil is too clear and unequivocal to admit of any doubt. Take the case of the Lewes House of Correction. The Inspectors of Prisons* inform us, that 'scurvy at one time prevailed in the prison: by an increase of the diet it disappeared. The diet was again diminished, and the scurvy again appeared. The diet was then permanently increased; the scurvy again disappeared, and has not since occurred.'

"The actual quantity of food required for the support of human health and life, is subject to considerable modification by a variety of circumstances; and, therefore, it is quite impossible to lay down a fixed rule, or to adopt any standard; for the quantity of food which may be suited to the wants of one individual, may be insufficient for another, or too much for a third. Age, sex, the amount and kind of exercise and labor, the constitution, the state of health, and the condition of life, are some of the modifying circumstances, the agency of several of which is too obvious to require comment.

"Captain Parry,† in his *Account of One of the Polar Expeditions*, states, that experience satisfied him that the following daily allowance was quite enough to support his crew on shipboard; that is, while performing the ordinary or regular ship duties:—

Biscuit . .	10 ounces
Beef pemmican‡ .	9 ounces
Sweetened cocoa powder	1 ounce
Rum . . .	1 gill
Tobacco . .	3 ounces per week.

"But this quantity was found to be by no means sufficient to support the strength of the men during their harassing journey across the ice, living constantly in the open air, exposed to the wet and cold for twelve hours a day, seldom enjoying the luxury of a warm meal, and having to perform very severe labor. Their strength became considerably impaired, owing to want of sufficient sustenance; and both Captain Parry and Mr. Beverley, the surgeon, were of opinion, that in order to maintain the strength of the men thus employed for several weeks together, an addition would be requisite, of at least one-third more, to the provisions daily issued.

"In framing prison dietaries, an important element for consideration is the amount and nature of the labor to which the prisoners are subjected; those who are put to hard labor requiring a greater quantity of food to enable them to support the augmented expenditure of power. Accordingly, in the dietaries framed by the Inspectors of Prisons, and adopted by Sir James Graham, Her Majesty's Secretary of State for the Home Department, this element has been kept in view.

"An opinion has of late prevailed, that the condition of life, as regards liberty or imprisonment, is a circumstance which modifies the quantity of food necessary for the maintenance of health. On this point I shall quote the opinion of one of the Inspectors of Prisons, in his own words:—'In the construction of a dietary for a House of Correction, it is not unfrequently assumed, that something less than what is the customary food of the laboring population of the vicinity, should be sufficient for those in the degraded condition of criminals. Accordingly, in those agricultural districts where meat forms but a very small proportion of the ordinary food, less has been accorded; and in some instances, none, without consideration being given to the wide distinction between the condition of the freeman and the prisoner—the one enjoying purity of air, active bodily and healthful mental exercise, social intercourse, choice and diversity of diet. It is under such circumstances, that the smallest modicum of animal food proves sufficient for the preservation even of the most robust health. But reverse the situation: place the individual, as an offender against the law, in a small, cold, ill-ventilated cell—a prey to his own reflections, or, what is worse, with his mind almost a vacuum, cut off from all real social intercourse, subjected to the irksome, uninteresting labor of treading a wheel, or picking oakum; it is in this condition, I contend, that the stimulus of animal food becomes indispensable for his support against the inroads of low and debilitating diseases. I scarcely recollect an instance of scurvy being prevalent in a prison, but where it might be distinctly traced to a want of variety in the diet, and its deficiency in nutritive qualities.'*

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* *Third Report of the Inspectors of Prisons.* Supplement to Part I. Home District, p. 94. 1838.

† *Narrative of an Attempt to reach the North Pole in Boats fitted for the Purpose, and attached to His Majesty's Ship Hecla, in the Year* 1827. London. 1828.

‡ Pemmican is prepared by drying large thin slices of the lean of the meat over the smoke of wood fires, then pounding it, and, lastly, mixing it with about an equal weight of its own fat. In this state it is ready for use without further cooking.

"That deprivation of liberty, with all its accompanying restrictions, exercises a depressing influence on the mind, and through this on the body, cannot be for a moment doubted. In this indirect way it becomes a means of affecting the organic functions; and thus it happens, that an amount of nutriment, which, under the most cheering circumstances, is barely sufficient to sustain health, may prove, when conjoined with depressing mental influences, totally insufficient for the maintenance of health, and may be followed by scurvy, and other diseases known to be common consequences of defective sustenance.

"And here I may bepermitted to remind my reader, that scurvy has ever been a disease remarkable for the influence exercised over it by the passions of the mind. In Lord Anson's Voyage, we are told, "that whatever discouraged the seamen, or at any time damped their hopes, never failed to add new vigor to the distemper; for it usually killed those who were in the last stages of it, and confined those to their hammocks who were before capable of some kind of duty. So that it seemed as though alacrity of mind and sanguine thoughts were no contemptible preservatives from its fatal malignity." Mr. Ives, in his Journal, also gives an excellent illustration of the beneficial influence of mental exhilaration on this disease; for he states, 'Upon the British fleet coming from the Bay of Hieres, (February, 1744,) our men understood that the enemy's fleet and ours were soon to engage. There appeared, not only in the healthy, but also in the sick, the highest marks of satisfaction and pleasure, and these last mended surprisingly daily, inasmuch that on the 11th of February, the day we engaged the combined fleets of France and Spain, we had not above four or five but what were at their fighting quarters.' Dr. Lind† relates a still more striking exemplification of the position here contended for, as having occurred at the siege of Bredain, 1625.

"In the Dietaries for Prisons recently adopted by the Secretary of State, the length of imprisonment has, very properly, as I conceive, been taken into consideration. For, if it be admitted that imprisonment has an injurious influence over the nutrition of the body, it is obvious that the longer the period, the more marked will be the effect. Those, therefore, who have to suffer prolonged terms of imprisonment require to be better nourished than those who are sentenced for shorter periods, in order to enable them the better to resist the depressing influences to which they are, for a more lengthened term, to be subjected; and the consequences of which (viz. loss of health and strength) constitute 'a punishment not contemplated by law, and which it is unjust and cruel to inflict.'*

"Observation and experiment have fully proved the absolute necessity of considerable variety of food for the preservation of health and life; and there is nothing surprising in this. The body is made up of many principles, differing the one from the other in composition and chemical properties; and we might, *à priori*, have presumed, that textures which are chemically different would require different aliments for their nourishment. The living body, as I have already stated (see p. 4, *et seq.*), has no power of creating elementary substances; and it is obvious, therefore, that the system must be supplied with foods containing all the elements which enter into its composition. Moreover, it is not sufficient to present animals with these elements in their raw or uncombined state, for the animal system has no power of forming its organic constituents out of simple or elementary bodies. It is capable of effecting a considerable number of combinations and decompositions; but there is a limit to its chemical powers. It cannot form the organic constituents of the tissues out of any substances which may happen to contain the same elements, but only out of those substances whose composition and properties are analogous to, or identical with, those of the principles of which the tissues are composed. With the exception of cellular tissue and of membranes of the brain and nerves, which vegetables cannot produce, Liebig denies that the animal organism has the power of creating any of the organic principles which compose the animal tissues.

"Nitrogenised foods are necessary for the formation of tissues, into the composition of which nitrogen enters. Thus proteïnaceous substances (fibrine, albumen, caseine, and gluten) serve for the formation of muscles, and of the albuminous tissues, and, in the case of infants nourished by milk alone, they must also become food for the gelatinous tissues (cartilage, cellular tissue, membrane, the true skin, &c.). But as the foods on which the adult animal feeds, contain, or are capable of yielding, gelatine, it is probable that the gelatinous tissues are, in this case, wholly or partially nourished from this source.

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* *Seventh Report of the Inspectors of Prisons.* II. Northern and Eastern District, p. iii. London. 1842.

† *Treatise on the Scurvy.*

* Sir J. R. G. Graham, in a *Circular Letter to the Chairmen of Quarter Sessions*, dated Jan. 27, 1843.

"Non-nitrogenised goods serve several important purposes in the animal economy; though perhaps their ultimate use is to act as fuel to be burnt in the lungs, and thereby to develope sufficient heat to support the high temperature necessary for the manifestation of vital power. Oily or fatty substances, sugar, and the starchy or amylaceous substances, serve this purpose. They save the injurious and excessive action of oxygen on the tissues of the body. 'By diminishing the amount of alkali in the blood, and by giving non-nitrogenous food, the scurvy is cured, or prevented, in consequence of such substances being acted on, instead of the tissues of the body. No other explanation can be given of the benefit which arises from vegetable acids, from fresh vegetables, from sugar, wine, beer, wort, treacle, potatoes, &c., all of which have been used with the best effects.'* Oily or fatty substances are absorbed, and afterwards either laid up in cells, to be consumed at some future time, or immediately burnt in the lungs, to furnish heat. According to Liebig, saccharine and farinaceous substances also contribute to the formation of fat, though, as I have before stated, Dumas denies this."

In conclusion, we recommend this well-written work to the perusal of our readers. No medical library will be complete without it.

MR. NOAD'S REPLY TO THE UNJUST REVIEW OF HIS WORK IN THE PHILOSOPHICAL MAGAZINE.

To the Editors of The Chemist.

Road, near Frome, July 18, 1843.

GENTLEMEN,—

Although I am well aware that it is seldom either good taste or good policy for an author to make a public complaint of the manner in which his work is reviewed, nevertheless there are instances in which, in justice to himself, he is called upon to do so;—when it is but too evident that the critique has been written with a bad *animus*;—when, in consequence of a little irregularity of expression, the meaning of a passage has been *intentionally* perverted;—when errors which a simple inspection might show to be merely *typographical* are eagerly seized, and brought forward in formidable array to prove gross ignorance on the part of the writer;—when these things are found, I say, in a review, an author may surely find sufficient excuse for deviating from the usual course, and for appealing to the public to decide whether the review be a *fair* and *honest* one or otherwise.

I am led, Gentlemen, to make these remarks, in consequence of a notice of my *Lectures on Chemistry*, which appeared in the *London, Edinburgh, and Dublin Philosophical Magazine* for this month; and you will greatly oblige me by allowing me to make, through your Journal, a few observations on the same, in doing which I shall be as brief as possible.

In the first place I must remark, that my book was *six months* in the Editors' hands, before they condescended to notice it at all; not that this delay could have been occasioned by pressure of business in the reviewing department of the periodical, for it is very rarely that we find any notice at all of new books: may we conclude from this that the book was, during the interval, read and re-read, for the purpose of finding passages for reprehension? And can it be possible that this anxiety to detect faults was occasioned by the fact that one of the Editors is himself the author of a work on Chemistry? I should be sorry to assign so unworthy a motive to any reviewer, nor should I have hinted at it in the present instance, could I see anything like fairness or justice in the observations which the Editors of the *Philosophical Magazine* have been pleased to make on my book.

Let me proceed to notice those passages which have obliged them to "withhold their approbation," and I think I shall have but little difficulty in showing that the objections raised are insignificant in the extreme. In page 22 the following passage occurs:—"Upon his philosophical writings, the reputation of Dr. Priestley must rest, his theological opinions are most deservedly condemned," &c. On this the reviewer remarks,—"In the historical sketch an account is given of the labours of nearly forty Chemists; with all of these but *one*, discordant as their theological opinions *must* have been, our author seems to agree, for Dr. Priestley alone is selected for reprobation on this subject, with which, we may remark, the author had no business to meddle;" then follows this ill-natured remark: "Does the author thus go out of his way to *anathematise* Dr. Priestley, lest his own reputation for orthodoxy should suffer for having lauded the doctor's discocoveries in science?"—Now, although it is certainly probable that the theological opinions of the various Chemists to whose labours I have referred were different, I see no reason why they *must necessarily* have been discordant: Dr. Priestley, on the other hand, is probably better known to most persons (not scientific) as a theological than as a chemical writer; *theology*, as he himself says,* was his "original and proper province;" and, as a theologian, will any one deny that his opinions are now nearly universally condemned? Are there many to be found in the present day who will presume publicly to deny the divinity of the Saviour; who will publicly teach that Christ was a mere man, possessed of no superior knowledge to other men; who will reject the doctrine of original sin and the atonement as absurd;—who will deny *mind* to human nature;—who will inculcate the abominable doctrine that every action, whether good or bad, is included in an unchangeable and unavoidable system, and consequently that no man has any control over his own actions;—and lastly, who will teach that the *future* world will not differ materially from this?—All this, however, was enforced by Dr. Priestley, and yet because I make the simple assertion that his fame will rest on his philosophical writings, (in which by the way I am supported by his own biographer, Dr. Thomson,)† I am accused of hypocrisy, and motives of the most contemptible character imputed to me. Perhaps, however, the reviewer is himself a follower of Dr. Priestley's creed; perhaps he is as great an admirer of his theological as I am of his chemical writings; if so, then I leave him more in "*pity than in anger*," to the full enjoyment of them.

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* Dr. Bence Jones *On Gravel, Calculus, and Gout*, p. 48. Lond. 1842.

My next mistake consists in having stated that Dr. Wollaston died in the 53rd instead of the 63rd year of his age. In making this statement, I have only to observe that I followed Professor Brande, who, in the 4th edition of his Manual, says, "Dr. Wollaston died in December, 1828, in the *fifty-third* year of his age," and I certainly thought that I might rely on so high an authority, though on referring to the *Encyclopædia Britannica* I find it to be a mistake, the learned doctor having been born Aug. 6th, 1766, and died Dec. 22nd, 1828; he was consequently in his 63rd year. I am next blamed for not having alluded to the labours of the late lamented Dr. Henry; now, though nobody can be more alive than myself to the important services rendered to chemical science by this gentleman, I am not aware that his name is connected with any important *epoch* in the science; and had I given an account of his contributions to chemistry, I could not have omitted to notice the works of some of his equally celebrated contemporaries, which would have encroached too much on my limited space.

I next proceed to notice the remarks on the Chapter on Oxygen, which the reviewer informs us contains several statements which require correction. The first objectionable sentence is this:—"Every human being on the face of the earth consumes nearly 25 cubic feet of oxygen every 24 hours, (45,000 cubic inches daily, according to Lavoisier, Seguin, and Davy,) and 112 lbs. of charcoal require for combustion 32 cubic feet." On this it is remarked, "We shall not object to the statement that 25 cubic feet of oxygen are consumed in 24 hours by every adult, but we may observe that this quantity is equivalent to 43,200, instead of 45,000 cubic inches." This is a piece of information which, with all due deference to the penetration of the reviewer, I did not require, and I believe that no person would, on reading the sentence in my book, be led to suppose that it was intended to make such an assertion as is here implied: the circumstance of the words, "45,000 cubic inches according to Lavoisier, Seguin, and Davy," being put in a *parenthesis*, is surely sufficient to show that the 45,000 cubic inches have nothing to do with the 25 cubic feet, but refer to another determination of the quantity of oxygen daily consumed by an adult, by Lavoisier, Seguin, and Davy. The latter part of the quotation, "112 lbs. of charcoal require for combustion 32 cubic feet of oxygen," is certainly a mistake; and though (as I shall presently show) it is an error entirely of a *typographical* nature, and though (as it is almost, perhaps, needless to say) it was detected after it was too late to make the correction, I should nevertheless have felt obliged to the Editors of the *Philosophical Magazine* for pointing it out, had they done so in a friendly spirit, seeing, as they must have done, that it was altogether a blunder of the press; and had they not made it a handle by which to condemn my book for inaccuracy, and myself for gross ignorance. In my manuscript the passage was written thus:—"1 *lb*. of charcoal requires for its combustion 32 cubic feet of oxygen," *which is correct*—nor is it difficult to see how the mistake must have occurred in the printing office, the 1 *lb*.

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* See the Preface to his *Experiments on Air*.

† See *Annals of Philosophy*, Feb. 1813.

having in the hurry of the moment been mistaken for 112 *lb.* It would, indeed, be difficult to imagine how " so enormous a blunder could have been perpetrated in the first instance," but it is not, perhaps, " so truly marvellous" as the reviewer seems to imagine, that the error should have escaped me while correcting the proof sheet, when it is considered that my book was printed in the *country*, at some considerable distance from my residence, and that it was brought out in *monthly parts*, so that much hurry was requisite in order to get the numbers in London ready for delivery by the appointed time.

I am well aware, Gentlemen, that it is very rarely that the excuses offered by authors in extenuation of mistakes which have been allowed to creep into their works are admitted by the public, but I cannot help *feeling* and *saying*, that in the present instance I have been dealt with rather too severely; and that much calculation and labour expended by the reviewer to point out the absurdity of my statement might have been saved.

I am next found fault with for saying that *four* gallons of oxygen gas is the maximum quantity obtainable from 1 lb. of peroxide of manganese, " of good quality," and the reviewer has been at the pains to calculate the quantity which ought *theoretically* to be obtained from 7000 grains, or 1 *lb.* avoirdupois, of *absolutely* pure peroxide, and which he finds to be $8\frac{3}{10}$ gallons:—now if, Gentlemen, you will have the goodness to refer to my book (page 143), you will find that the *candid(?) reviewer* has presumed to omit the word " about," and to insert the words, " of good quality;" the passage runs thus, " we are here supposing the peroxide to be pure, which it never is, as met with in commerce; we may consider four gallons of gas from one pound to be *about* the maximum obtainable quantity." Let us, however, see what Dr. Kane (one of the Editors of the *Philosophical Magazine*,) says himself on the subject, in his *Elements of Chemistry*. In page 394, I find the following remarks:—" Hence, 1 lb. Troy is capable of furnishing seven imperial gallons of gas. The oxide of manganese found in commerce is not, however, pure; in general, it does not contain more than 65 per cent. of pure oxide, and hence the quantity furnished by a pound of it is about *two-thirds only of that just stated*—that is, $\frac{2}{3}$ of 7 gallons, or $4\frac{2}{3}$ gallons." Where the great difference can be between " $4\frac{2}{3}$ gallons," and " about 4 gallons," I cannot perceive; and I think it will be agreed by every impartial person, to make it a subject of public reprehension savours strongly of *hypercriticism.* The reviewer, however, evidently wished to represent it as a great mistake; and at first sight it certainly would have been so: none knew, however, better than the reviewer, that his observations were *intended* to deceive, and that his criticisms were really unfounded.

My next mistake consists in stating that the 1438 grains of oxide left after heating 1638 grains of peroxide of manganese, is "a mixture" of 992 grains of deutoxide and 446 grains of protoxide of manganese. Let us now turn to another high chemical authority, and see the extent of my inaccuracy in this instance. In Professor Graham's *Elements of Chemistry*, page 244, the following passage occurs:—"Three equivalents (1638 parts) lose two equivalents of oxygen (200 parts) and leave a *compound* of one of deutoxide and one of protoxide." In this case, then, the Editors of the *Philosophical Magazine* are obliged to withhold their approbation from my work, because I employ the word "*mixture*" instead of the word "*compound:*" this is actually the full extent of my mistake!!

I now come to the master-piece of the whole review—to the grandest and most profound effort of all.—A "mistake" is next noticed, which must eternally condemn my *Lectures on Chemistry*, and stand for ever as a "*monumentum perenne*" of the penetration and sagacity of the reviewer. " We are informed that half an ounce of chlorate of potash (218·75 grains) should yield 270 cubic inches of oxygen gas, he having just before stated that 1532 grains yield 600 grains of oxygen; 218·75 therefore give 85·7 grains, measuring only 249 instead of 270 cubic inches." Now, Gentlemen, whatever may be thought of the other strictures on my book, it will undoubtedly be acknowledged by all, that this, to say the least of it, is a very great *miss* on the part of the reviewer. Let me first quote the passage as it actually stands in page 144 of my book: " 1532 grains of chlorate of potash yield 600 grains of oxygen, and 932 grains of chloride of potassium, *practically*, half an ounce should yield 270 cubic inches, or nearly a gallon of pure oxygen gas." I will first test my statement by Professor Graham's work, page 247:—" Half an ounce of chlorate of potash should yield 270 cubic inches, or nearly a gallon of pure oxygen gas." I will now see what Dr. Kane says, and in quoting from his work, let me particularly impress upon the readers of this vindication, *that Dr. Kane is himself one of the Editors of the Philosophical Magazine, and as such is responsible for any review which it may contain.* In Dr. Kane's *Elements of Chemistry*, then, page 396, I find the following passage :—"Hence 100 parts of chlorate of potass give 39 of oxygen by weight, or *an ounce Troy*, 187 *grains, or* 543 *cubic inches.*" Now, if an ounce will furnish 543 cubic inches, it will be admitted, I presume, that half an ounce should furnish 271½ cubic inches, or *practically* 270 cubic inches, as I state in my book. It never, I suppose, occurred to the reviewer, whilst penning his strictures on my work, that the ounce may have *two values*;—that there is such a thing as the *Troy* ounce = 480 grains, as well as the *avoirdupois* ounce = 437½ grains,—perhaps he did not know this;—perhaps, however, he may rejoin, "You have no business to employ Troy weight in your calculations:" be it so—but then, my good friend, have you never heard the vulgar saying,—"Those who live in glass houses should not commence throwing stones?" I had clearly as much right to allude to the Troy ounce as Dr. Kane had; besides which, we find Professor Graham doing the same, so it is not so unusual a thing after all. I will not occupy your space by any remarks on the evident *desire* to find fault, evinced by the foregoing quotations; but as I have already trespassed somewhat largely on your pages, I will briefly allude to the two remaining "errors" which have been selected for animadversion, and then leave the matter for the consideration of your readers, without one word of comment. Note, page 144, "I find that the best chlorate of potash yields from 96 to 98 per cent. of pure oxygen."—"For some time," says the reviewer, "we were puzzled to attach any meaning to this statement, but at length we concluded that the following is what the author meant:—I find that 100 grains of the best chlorate of potash yield from 96 to 98 cubic inches of pure oxygen gas." The "author," however, meant nothing of the sort; and although I am ready to admit that the sentence might have been *worded* better, any person whose understanding was not *intentionally* dulled, would immediately have understood the meaning to be this:—"The gas from chlorate of potash is not *absolutely pure;* it contains from 96 to 98 per cent. of *real* oxygen gas." I here allude to the best chlorate of potash that is met with in commerce: when the salt was prepared with scrupulous attention, and the gas obtained with the greatest care, Gay-Lussac could only detect an impurity amounting to 4 volumes in 1000.

Lastly, it was thought worth while to animadvert on the following passage:—"From an equivalent of oxide of mercury we get 100 grains or nearly 300 cubic inches of nitrogen gas, and 1266 grains of mercury are found in the receiver." "It should have been stated," observes the reviewer, "that from 1366 grains, *which may be considered as representing an equivalent, &c.:*" and the passage is quoted as exhibiting "an extraordinary degree of confusion," though with what justice others must determine. Such, Gentlemen, are the "errors" which oblige the Editors of the *Philosophical Magazine* to withhold their approbation from my *Lectures on Chemistry.*

I remain,
Gentlemen,
Your obedient servant,
Henry M. Noad.

THE ELECTRICAL MAGAZINE.

Conducted by Mr. Charles V. Walker. London: Simpkin, Marshall and Co. No. I.

This Magazine, the publication of which we announced in our last No., has fully realised our anticipation, and will fill up a vacuum in scientific literature. The publication of the Proceedings of the Electrical Society having ceased, the necessity for a work like the present, would have been more deeply felt.

The *Electrical Magazine* is a faithful reporter of the discoveries in Electricity within the period of publication in this country and on the Continent, and we hail this new laborer in the field of Physical Science.

The present No. contains articles by Karsten (On Electric Pictures), Bunsen, De la Rive, Becquerel, Boquillon, Morren, Dr. Elice, Matteucci, Mr. Bain, and Mr. J. P. Gossiot; under the heading of Scientific Meetings, we have abstracts of papers read at the Royal Institution, the Institution of Civil Engineers, and the Society of Arts, by Prof. Faraday, Prof. Grove, Mr. Smee, Mr. F. Pellatt, Professor Wheatstone, and Mr. Cooke. The Electrical papers of the various English Journals are also presented to the reader in a condensed form.

We recommend such of our readers as devote a portion of their time to the study of Electrical science to subscribe to this truly valuable Magazine, and we wish the editor every success in his undertaking.

THE BRITISH QUARTERLY JOURNAL OF DENTAL SURGERY.

London: John Churchill. No. II.

This No. fully maintains the character of the first, and is quite as much entitled to our commendation. It is replete with highly interesting matter.

PHOTOGENIC MANIPULATION: *Containing Plain Instructions in the Theory and Practice of the Arts of Photography, Calotype, Cyanotype, Ferrotype, Chrysotype, Authotype, Daguerreotype, and Thermography.* By GEORGE THOMAS FISHER, Jun. Illustrated by Woodcuts. London; George Knight and Sons.

A VERY excellent little work, and one which those who desire to perform any of the processes mentioned in the title, cannot do better than purchase. One shilling, thus expended, will procure more really valuable information than is often obtained for five times that sum.

BOOK RECEIVED.

PRACTICAL DIRECTIONS IN THE PREPARATION OF AERATED WATERS, and the Various Compounds of Carbonic Acid Gas, by Bakewell's Patent Apparatus: with Observations on the Pharmaceutical and Therapeutical Agencies, and their Efficacy in the Cure of some of the most Important Diseases of the Human Body, viz., Indigestion, Nervous Atony, or Mental Depression, &c.; with Cases in Illustration. By ROBERT VENABLES, M. B. London: G. Knight and Sons.

[A very useful little work, which will be noticed in our next.]

NOTICES TO CORRESPONDENTS.

"A CONSTANT READER OF THE CHEMIST" shall hear from us by post according to his request.

"A. M."—First wash the warts with warm water, or a solution of caustic potassa, or scrape the surface of them with a knife; then apply concentrated nitric acid. Repeat this treatment several times, until the object is effected. The nitric acid must be allowed to dry on. After trying this, let us know the result; and, if necessary, we will advise again.

"R. C., WHITBY," shall hear by post.

More letters from Members and Associates of the Pharmaceutical Society! We are glad to find that our arguments have had so beneficial an effect.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN JUNE, 1843.

BY E. THOMPSON.

BAROMETER.

Monthly mean	29·71
Mean at 9 A.M. . . .	29·69
Mean at 3 P.M. . . .	29·73
Mean at 9 P.M. . . .	29·72
Maximum on 12th . .	30·04
Minimum on 9th . . .	28·95
Range	1·09

THERMOMETER.

Monthly mean	55°
Mean of maxima . . .	63
Mean of minima . . .	48
Maximum on 6th . . .	71
Minimum on 5th . . .	43
Range	28

WIND.

	Days.		Days.
N.	1	S.	0
N. E.	12	S. W.	3
E.	4	W.	4
S. E.	4	N. W.	1

RAIN.

2·79 inches.

WEATHER.

	Days.		Days.
Clear	9	Continued rain	3
Cloudy . . .	6	Mist . .	0
Overcast . .	4	Lightning .	1
Shower . . .	8	Thunder .	1

GENERAL REMARKS.

During the first twelve days of this month the rain continued which had characterised the two former months. The consequence of this unusually wet spring has been, that fruit of all kinds is very deficient in quantity, and great fears were entertained for the crops of corn.

The latter part of the month, however, has been fair, though the prevalence of easterly winds has kept down the temperature.

At Leeds, 10 miles distant, the measles extensively prevail.

NOTA BENE.—*All Communications, Books for Review, and Substances to be analysed, must be addressed "To the Editors of The Chemist, Care of Mr. Hastings, Publisher,* 13, *Carey Street, Lincoln's Inn Fields, London." Communications must be prepaid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON BUTYRIC ACID.*

BY MM. PELOUZE AND GELIS.

Butyric acid was discovered in 1814, among the products of the saponification of butter, by M. Chevreul, who has given its history with much care in his work on the fatty bodies of animal origin. Since that period, butyric acid has not been the subject of any extended investigation, which must doubtless be attributed to the length and difficulty of its preparation, which are so great, indeed, that butyric acid is still but rarely met with in chemical laboratories.

However, M. Simon has already made known some of the properties of butyric ether, of which M. Chevreul had already some idea, and which he appears not to have obtained in a state of purity.

Bromeis *(Annales de Chémie et de Physique, tome* vii., 3e Série) repeated in the laboratory at Giessen, the analysis of butyrate of baryta, on some fine crystals of that salt prepared by M. Chevreul himself, and sent by him to Professor Liebig.

On the other hand, Nöllner has described, under the name of *pseudo-acetic acid*, a peculiar acid arising from the spontaneous fermentation of tartrate of lime; and Berzelius ascertained, by the examination of a sample of pseudo-acetate of lead sent to him by Nöllner, that the acid discovered by this chemist was a mixture of acetic and butyric acids.

In repeating the experiments of M. Frémy on the remarkable modification which sugar undergoes in the presence of animal membranes, and those of Boutron and Frémy on lactic fermentation, we have observed several curious results. If sometimes, indeed, the conversion of milk into lactic acid, under the influence of caseum, is simple and complete, most frequently, and without its being necessary to co-operate in different conditions to those indicated by those skilful chemists, the most complicated reactions are observed.

All the substances which are capable of furnishing lactic acid, have the same composition as that acid; or, if they differ from it, it is only in containing a little more or a little less water; the lactic fermentation consists, then, in a simple molecular change, with or without fixation of water, but always without disengagement of gas: however, in a great number of cases we have observed it become effervescent, like alcoholic fermentation; and, which is a remarkable thing, we have constantly found pure hydrogen amongst the gaseous products.

This fact reminds us of an observation of M. Desfosses, which has hitherto remained unexplained. This chemist had detected the existence of a slight disengagement of hydrogen in analagous fermentations; but as, in our experiments, we sometimes obtained this gas in very great quantity, we thought it necessary to investigate the cause of its formation, and we have been fortunate enough to ascertain that it is due to a new fermentation, during which, in place of the sugar which disappeared, we observed the formation of one of the products of animal organisation, one of the acids of butter, in a word, butyric acid.

This observation will necessarily occupy an important place in the present discussion concerning the formation of fats in animals. Without wishing in any way to guess at the means which nature employs in the very numerous modifications which it causes aliments to undergo, we cannot help remarking that the conversion of sugar into butyric acid is effected without the intervention of any considerable elevation of temperature, and without the employment of any of those energetic reagents capable of destroying the equilibrium and vitality of the animal economy, but that this conversion takes place, on the contrary, in very simple conditions and with matters which living nature presents to us.

If this resemblance has any appearance of foundation, it may be conceived that it may be the same with the ordinary fatty acids relative to butyric acid and to sugars, as well as to starch, which in so many respects resembles these last bodies.

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* *Comptes Rendus*, No. 23, June 12, 1843.

After many experiments relative to the best process to be followed for obtaining from sugar the greatest possible quantity of butyric acid, we have stopped at the following method :—

Add to a solution of sugar, marking 10 degrees of the saccharometer, a small quantity of caseum and sufficient chalk to saturate all the butyric acid which is afterwards formed: this mixture is left at a constant temperature of from 75° to 85° F.; it very soon undergoes profound alterations; the fermentation, at first viscous, afterwards lactic, gradually becomes butyric; these decompositions are sometimes successive, sometimes simultaneous, without it being possible to regulate their progress. The disengagement of gases becomes more abundant, and, in submitting them to analysis, a period arrives when the free hydrogen amounts to one-third of the volume of carbonic acid. At this period, the butyric fermentation is in all its force; when, finally, at the end of several weeks, all disengagement of hydrogen has ceased, the operation is finished, and the liquor no longer contains anything but butyrate of lime.

Having remarked that the conversion of sugars into butyric acid was apparently effected so much the more easily as we operated on more considerable masses, we have submitted to fermentation such quantities of sugar that we have been able to procure 20 or 25 kilogrammes of butyrate of lime.

The extraction of pure butyric acid from butyrate of lime is easy; it is executed in the following manner :—

One kilogramme of butyrate of lime is moistened with from three to four kilogrammes of water to which from three to four hundred grammes of commercial hydrochloric acid have been added. This mixture is introduced into a distilling apparatus, and it is boiled until 1 kilogramme of distilled liquid is obtained from it. This liquid is a mixture of water, butyric acid, and a small quantity of acetic and hydrochloric acids. It is put in contact with chloride of calcium which determines the formation of two liquids of different densities. That which remains at the top is butyric acid; that which is most dense contains the other matters. The lightest liquor is removed and submitted to distillation in a tubulated retort furnished with a thermometer. The first portions which pass into the receivers are more or less aqueous; the boiling point, at first not very high, very rapidly mounts to 317° F., at which point the temperature remains almost stationary. This is an indication that the acid which distils over is concentrated. It is collected by continuing the distillation until the retort contains only a small quantity of acid mixed with a little coloring matter, chloride of calcium, and butyrate of lime.

The acid is boiled for some time to free it from a few traces of hydrochloric acid, and is again distilled. It is then perfectly pure. The first portions distilled are not lost; they are used for the preparation of butyrates; or else, mixed with chloride of calcium, a fresh quantity of concentrated butyric acid may be obtained from them.

COMPOSITION OF BUTYRIC ACID.

M. Chevreul did not analyse butyric acid in the free state, but only in combination with the metallic oxides, and he deduced from his analysis the atomic formula $C^8\,H^{11}\,O^3$, for the real acid, as it exists in the anhydrous butyrates—for example, in that of lead.

Berzelius proposed substituting for the above formula $C^8\,H^{10}\,O^3$, in order to do away with the odd number of atoms of hydrogen which it presents.

Bromeis *(op. cit.)* was led to a different result. He admits the formulæ $C^8\,H^{12}\,O$.

We think that we may assert that not one of these three formulæ is correct, and that they must be replaced by the atomic numbers $C^8\,H^{14}\,O^3\,H\,O$, which represent monohydrated butyric acid. The analyses which led us to establish this composition were made with extreme care, and controlled by many different means. They are in harmony with the constitution of butyrate of silver, butyric ether, and butyrate of methylen.*

We hasten to add that M. Chevreul had put beyond doubt the relation of 1 to 3 between the oxygen of the base and that of the butyric acid in the series of neutral butyrates, and that he likewise rendered probable the existence of eight atoms of carbon in each atom of acid.

The composition of butyric acid, its proportion which amounted, in many experiments, to above one-third of the weight of the sugar, the disengagement of free hydrogen and of carbonic acid (independently of that evolved from the chalk), allow us to suppose that, under the prolonged action of ferments, sugar is decomposed in the following manner :—

$$\underset{\text{Glucose.}}{C^{12}\,H^{28}\,O^{14}} = \underset{\text{Butyric Acid.}}{C^8\,H^{14}\,O^3,\ H^2\,O}$$
$$+\ 4\,C\,O^2 + 8\,H + 2\,H^2\,O$$

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* Free butyric acid is isomeric with acetic ether and aldehyd. We have in vain endeavored to produce it with the first of these two substances.

It is clear that this formula represents only the final result, for several fermentations precede, as we have already said, the formation of butyric acid.

The properties of free butyric acid have been described with great accuracy and care by M. Chevreul, so that it was easy for us to convince ourselves of the identity of the acids arising, on one hand, from the saponification of butter, and on the other hand, from the fermentation of sugar. However, not to leave any doubt in our mind in this respect, we compared our acid with some butyric acid which we extracted from butter. We could not observe the slightest difference between these acids.

Butyric acid is a perfectly colorless and transparent liquid, of great mobility, and of an odor which calls to mind at once that of vinegar and that of strong butter. It is soluble in all proportions in water, alcohol, and wood spirit. It boils at nearly 317° F. under the ordinary pressure, and distils without sensible alteration. Its vapor is inflammable, and burns with a blue flame.

A prolonged cold of minus 20° C. did not effect any change in butyric acid; its taste is strongly acid, and burning. It attacks and disorganises the skin like the most powerful acids.

Its density is 0·963 at + 59° F.

Concentrated sulphuric acid does not alter butyric acid at the ordinary temperature; it is only under the influence of an elevated temperature that signs of decomposition are exhibited; even then the greater part of the butyric acid is distilled over.

Chlorine rapidly alters butyric acid. When a few drops of this acid are poured into a flask filled with dry chlorine, the production of a very large quantity of hydrochloric acid is immediately remarked, and the sides of the flask are speedily covered with a multitude of crystals bathed in a viscid liquid of a light yellow. These crystals are oxalic acid; the liquid is a peculiar acid, containing chlorine among its elements. It is almost insoluble in water: soluble in all proportions in alcohol. Potassa, soda, and ammonia, combine with it, and form salts which are very soluble in water. This chlorated acid will be the subject of an ulterior examination.*

Iodine dissolves with heat in butyric acid, and is separated from it by boiling. The reaction between these two bodies is very slow and very difficult. However, the production of a small quantity of hydriodic acid gas is remarked.

We have little to add to M. Chevreul's observations on the combinations of butyric acid with bases. If we had had any doubts remaining as to the identity of the butyric acid extracted from butter with that resulting from the decomposition of sugar, these doubts would have disappeared by the very identity of our results with those of M. Chevreul.

Butyrate of lime is soluble in very considerable quantity in cold water; this solubility diminishes as the temperature of the solution rises, and, when it has arrived at the boiling point, almost the whole of the salt is separated under the form of transparent prisms. This property was noticed by Chevreul. We have observed it in the butyrate of lime arising directly from a butyric fermentation, and the same salt in the pure state.

Butyrate of lime very easily loses its water of crystallisation, and is well fitted for the determination of the capacity of saturation of butyric acid.

Submitted to dry distillation, it gives, among other products, an odorous volatile oil, presenting the odor of essential oil of labiate flowers. The production of this oil was observed by M. Chevreul.

Butyrate of baryta crystallises with facility in long and perfectly transparent flattened prisms, containing four atoms of water of crystallisation. Submitted to the action of a temperature below 212° F., it forms into a transparent glass, without losing in weight. It produces on the surface of water the same movements as camphor, and with at least equal intensity. This property was not noticed by Chevreul.

Butyrate of potassa is deliquescent, but much less so than the acetate of the same base. In the salts of silver and of protoxide of mercury it produces white shining bracteæ, which greatly resemble the precipitates formed by acetate of potassa in the same salts.

Butyrate of silver may, with facility, be washed and dried. This salt is best adapted for analysis. Its decomposition by heat takes place without deflagration. The residue of silver which remains after calcination is perfectly pure, and white in the parts which are in contact with the air; but to obtain an accurate result, the metal must be dissolved in nitric acid, and carefully calcined *de novo*, because a small quantity of carbonaceous matter concealed under the layer of silver always escapes combustion.

Butyrate of lead, which is obtained by

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* Butyric acid absorbs chlorine with extreme facility. This absorption is so prompt, that, when the sun is not concealed by clouds, the most rapid current of chlorine does not carry out, for a long time, any portion of this gas from the vessel into which the butyric acid has been introduced.

adding butyric acid to a solution of acetate of lead, is precipitated under the form of a colorless liquid of great density. It is maintained so for a long time. It may easily be washed by decantation. Dried at 266° F., it is formed of one equivalent of acid and one of oxide of lead.

Butyrate of copper is very sparingly soluble in water; it may be obtained directly; or, by adding a salt of copper to a solution of butyrate of potassa, a bluish green precipitate is formed, which may be crystallised by dissolving it in boiling water. The formula of this salt is :—

$$Cu\,O,\ C^{8}\,H^{14}\,O^{3},\ 2\ H^{2}\,O.$$

Heat deprives it of one of these two atoms of water; the other resists and is lost only when the salt itself is decomposed.

Butyrate of magnesia is very soluble in water. It crystallises in beautiful white plates, presenting the micaceous aspect of boracic acid, and containing 5 atoms of water, of which heat readily deprives it.

Butyrate of ammonia is deliquescent.

The phenomena which butyric acid presents with alcohol, wood spirit, and glycerine, are very curious.

BUTYRIC ETHER.

The etherification of alcohol by butyric acid is effected only slowly, and with difficulty; but when a certain quantity of sulphuric acid is added to the mixture of these two substances, the formation of butyric ether may be said to be instantaneous. If, for example, 100 grammes of butyric acid be put in contact with 100 grammes of alcohol and 50 grammes of concentrated sulphuric acid, the mixture is heated, and is immediately divided into two liquids of unequal density. The lighter is butyric ether, the weight of which is nearly equal to that of the butyric acid employed.

But a more curious fact is that the presence of even a very considerable quantity of water forms no obstacle to the etherification. It is thus, that, in the example which we have just quoted, the proportion of water may exceed that of the sulphuric acid, without diminishing the truly extraordinary aptitude of this acid for the etherification of alcohol. No case is known of so easy and so prompt a formation of a compound ether.

The importance of the foregoing facts in the discussion of the phenomena of etherification, and the support which they afford to the ingenious views of Mitscherlich concerning one of the most delicate theories of organic chemistry, will readily be understood.

The butyric ether obtained as just described requires for its purification only to be washed with water, dried over chloride of calcium, and submitted to distillation.

The following are its principal properties: it is liquid, colorless, very mobile, very inflammable, and of an agreeable odor, somewhat resembling that of the pine-apple. It is sparingly soluble in water, and soluble *ad infinitum* in alcohol and wood spirit. It boils at 230° F. Its density of vapor has been found equal to 4·04. Four volumes of this vapor represent one molecule of ether.

The alkalis, even when boiling, decompose it but slowly. It then gives the ordinary products of the decomposition of compound ethers.

The formula of butyric ether is :—

$$C^{0}\,H^{4}\,O^{3},\ C^{4}\,H^{10}\,O.$$

BUTYRATE OF METHYLEN.

The butyrate of methylen is prepared with the same facility as butyric ether, and is purified by a similar process. The mixture of butyric acid with wood spirit and sulphuric acid immediately gives rise to the formation of a considerable quantity of butyrate of methylen.

The formula of the butyric ether of wood spirit is $C^{8}\,H^{14}\,O^{3},\ C^{2}\,H^{6}\,O$. It is liquid, colorless, inflammable, and of a peculiar odor, somewhat analogous to that of methylic alcohol. It is difficultly soluble in water; soluble in all proportions in alcohol and wood spirit: it boils at about 215° F. The density of its vapor is 3·52; its molicule represents four volumes of vapor.

The extraordinary facility with which butyric acid etherifies alcohol and wood spirit, under the influence of sulphuric and hydrochloric acids, induced us to attempt some combinations of the same order on substances generally regarded as belongiug to the *series of alcohols*. Such are particularly the essential oil of potatoes, ethal, and glycerine. The study of the products of these reactions will form part of a second number which we propose to publish. We shall now confine ourselves to presenting some observations relative to the action of butyric acid on glycerine.

When a mixture of these two substances and sulphuric acid is gently heated, and afterwards diluted with a great quantity of water, a slightly yellowish oily liquid immediately separates from the liquor, which may be washed with large quantities of water; for it is not, or only extremely sparingly, soluble in that liquid.

This fatty matter is soluble in all proportions in concentrated alcohol and in ether, from which water easily separates it.

Saponified by caustic potassa, butyric acid and glycerine are extracted from it. Its formation takes place at the ordinary temperature, when a current of hydrochloric acid gas is passed into a mixture of glycerine and butyric acid. Water immediately separates from this mixture a considerable quantity of the new fatty matter.

The formation of this substance, its conversion by the hydrated alkalis into butyric acid and glycerine, and likewise some other circumstances, lead us to consider it as the same fatty matter which M. Chevreul discovered in butter, and which he calls *butyrine.* However, we give this opinion with reserve; for, in the first place, butyrine has not yet been obtained in a state of purity, and its elementary composition is unknown; and, in the second place, if the hydrated glycerine, or that in the sulphoglycerate of lime, is well known, the numbers which express the quantity of water which it should lose in combining with the acids to form neutral fatty matters, are perhaps not well fixed, which must especially be attributed to the always very considerable weight of the equivalent of neutral fatty bodies.

A comparative study of the butyrine extracted from butter, and of the matter of which we have been speaking, alone will enable us to solve the interesting question of the identity or dissimilarity of these two substances.

After the reading of this paper, M. Payen requested permission to remark, that by its composition, as now admitted, butyric acid is placed between valerianic and acetic acids, two of the products of the fermentation of sugars.

The production of butyric acid, so interesting in the circumstances in which MM. Pelouze and Gelis have observed it, is found comprised in an hypothesis which MM. Dumas, Boussingault, and Payen, have presented, in communicating their memoir on the fattening of animals and the production of milk.

Moreover, it may perhaps be here remembered, said M. Payen, that butyric acid is far from constituting the true fatty substance forming the mass of butter; and it may be added, it would doubtless be still more difficult and more important to obtain butter without butyric acid, and even without butyrine, than to produce this volatile acid and the butyrine without butter.

That as butyric acid, either free, or in a state of combination with butyrine, probably does not amount to $\frac{1}{100}$ of the total weight of butter, the production of this acid at the expence of sugar, would be very insufficient for giving the key of the formation of the fatty substance of cream in the milk of cows.

ON THE DIGESTION OF THE HERBIVORA.*

BY MM. PREVOST AND MORIN.

The investigations which we detail in this memoir have for their object the determination of the state in which the alimentary substances prepared in the simple or compound stomach of the herbivora, are delivered to the action of the intestines.

We set out with the idea, that, in ruminating animals, the caseous or albuminous matters of plants are dissolved by the alkali arising from the salivary glands, perhaps excreted also by the first and second stomachs; that after having been expressed from the masticated mass into the third stomach, they are precipitated by the free hydrochloric acid of the stomach; that they are deposited on the surface of this stomach, and are afterwards passed in the form of emulsion by the bile into the small intestine. The nutritive matters of vegetables, extracted in the first stomach, then separated by precipitation in the fourth stomach, would form pure chyme, which isolated by this means from other substances useless to alimentation, would be again taken up by the bile, half dissolved by it, and delivered by its intermedium to the action of the absorbent vessels of the intestines. This mode of view was based on various observations: the uniform alkalinity of the liquid expressed from the alimentary substances contained in the first stomach; the well-ascertained acidity of that of the fourth; and the very ordinary presence of a white, glairy or almost membranous matter on the sides of the latter organ.

The same considerations apply to the herbivora furnished with a single stomach; only these different actions are concentrated or combined in a single apparatus.

Our experiments were made on sheep and rabbits, in order to make a parallel study of the progress of digestion in these two orders of herbivorous mammalia.

SHEEP.

The first stomach of a sheep contained an herbaceous mixture, giving out an excrementitious odor, which furnished, by pressure, nearly five pints of a greenish liquid, having the appearance of an emulsion, and whose surface was almost immediately covered with an iris-colored pellicle. This liquor soon returned the blue color of litmus. The sides of the first stomach feebly reacted in the same manner. Alkali, therefore, was present.

The third stomach contained only expressed vegetable matters. These matters did not present any very evident reaction, but it was rather acid.

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* *Journal de Pharmacie,* May, 1843.

The fourth stomach contained a liquid mixed with some parts of plants, weighing 250 *grammes*, of a much less disagreeable odor than that of the liquid of the first stomach, becoming clear by filtration, yellow, and decidedly acid. The sides of the folds or valvules of the fourth stomach were covered with a small quantity of whitish glutinous matter. The liquor extracted from the first stomach, did not form any deposit when left to itself. The addition of very dilute hydrochloric or sulphuric acid produced in it a coagulum, especially with the assistance of heat. Acetic acid did not act thus.

One hundred grammes of this liquor were mixed with very dilute hydrochloric acid. Litmus paper began to be reddened only when the quantity of acid represented 0 gr. 20 of anhydrous subcarbonate of soda. The flocculent precipitate produced by the addition of the acid was redissolved by stirring the liquor. The separation of the coagulable matter was completed only when the acid added was equivalent to one gramme of alkaline carbonate.

In order to precipitate this substance from the five pints of liquid contained in the first stomach, therefore, it was necessary to mix with it an acid liquor representing 25 grammes of subcarbonate of soda, or containing 17 grammes of anhydrous hydrochloric acid. But the free acid of the fourth stomach, estimated as hydrochloric acid, amounted to only 0 gr. 125, which would not amount to $\frac{1}{135}$ of that required for precipitating the albuminous matters from the whole of the liquid of the first stomach.

To maintain the idea that the chyme is precipitated by the liquors contained in these two stomachs it would, therefore, be necessary to admit, and which is very probable, that free hydrochloric acid is incessantly developed in the fourth stomach, and that the liquid of the first stomach is introduced into it successively and in small quantities at a time. Moreover, in this experiment, we did not find any notable deposit on the sides of the fourth stomach, and the mixture of the liquids extracted from the first and fourth stomachs produced no precipitate, even by causing the acid to predominate.

Twelve other fourth stomachs, opened shortly after the sheep had been killed, did not present any deposit on the sides. The contents were moderately acid.

Several fourth stomachs, opened after a cooling of twenty-four hours, contained a glairy deposit, applied against the surface. It was very easily separated from the other matters contained in the stomach, because water did not remove it, whilst they were detached from the sides of the stomach with the greatest facility by means of a blunt knife. This glairy substance had a powerful acid reaction, which disappeared at the end of some hours by a commencement of putrefaction. By several additions of distilled water it was only partially dissolved. The filtered liquor contained only albumen and traces of another substance to which we shall afterwards return. No caseum was found in it, for acetic acid produced no precipitate. By again washing the glairy matter with distilled water, heated to 98° F., a fresh quantity of pure albumen was separated. The residue, insoluble in water, had the characters of coagulated albumen.

The liquid portion of the contents of the same fourth stomachs, after having been filtered, was quickly covered with an iris-colored pellicle. Hydrochloric acid occasioned in it no precipitate. By ebullition a voluminous coagulum of albumen was separated. The filtered liquid residue was not precipitated by acetic acid, but alcohol produced in it a very abundant white deposit. This substance, redissolved in water, formed precipitates with liquid chlorine, protochloride of mercury, sulphate of copper, nitrate of silver, the basic, neutral, and acid acetates of lead, alum, and persulphate of iron. But it likewise precipitated ferrocyanuret of potassium, which indicated the presence of a small quantity of albumen. Tannic acid produced a white coagulum, soluble by heat, and reappearing by cooling.

These various reactions show the presence, in the liquid of the fourth stomach:—

Of uncoagulated *albumen;*

Of a matter similar to that which we found in the cotyledons of the cow, and which we designated by the name of *gelatiniform matter.*

There was no *caseum.*

RABBITS.

In a great number of experiments made on these animals, we have constantly found the masticated alimentary substance ordinarily green against the small curvature of the stomach, brown beyond this layer, and occupying two-thirds of the cavity, then under the form of globules of the size of peas in the *cul-de-sac* of the cardia, and extending in a thin layer to the middle of the great curvature of the stomach. These globules were enveloped in a white pellicle, which very easily separated from them. They varied from 20 to 200. It appeared to us that their number was greater when the animal was killed shortly after having eaten. The masticated mass and the sides of the stomach had, in general, a very distinct acidity, except near the pylorus. At the orifice even the reaction was alkaline. The part of the masticated mass which had preserved the green color was much less acid than the rest, doubtless because it was not yet impregnated with the gastric juice.

OF THE LIQUID PORTION OF THE MASTICATED MASS.

The contents of the stomach of a large rabbit furnished, by pressure, 95 grammes of very acid liquor, which was filtered with difficulty, and in which was deposited a white pulverulent substance, in great measure due to silica, and doubtless arising from the vegetable matters disaggregated by the gastric juice. This liquor became clear by repose, and produced no coagulum, even at the end of two days. No change was manifested by the addition of hydrochloric acid or potassa; by saturating the acid by ammonia, and by boiling it, a large proportion of albumen was separated, after filtration; alcohol precipitated from it a substance soluble in water, forming with tannic acid a combination soluble by means of heat, and not by cold, and possessing the other characters of gelatiniform matter.

Two grammes of the liquid of the stomach, evaporated at a moderate heat, furnished 0gr. 07 of solid substances, soluble in water, composed in great part of the two substances which we have just mentioned, and of a small quantity of alkaline chloride, or other salts.

OF THE NATURE OF THE ACID OF THE MASTICATED MASS.

We divided the expressed and filtered juice of the masticated mass of a rabbit into two equal parts. One was immediately precipitated by nitrate of silver, after the addition of nitric acid; it required 0gr. 11 of nitrate. The other was evaporated and dried in an oil bath carried to 300°F. The residue redissolved in distilled water, and nitric acid being added to it, required only 0gr. 89 of nitrate of silver for its precipitation. The chlorine was, therefore, approximatively—

For $\frac{3}{4}$ under the form of fixed chlorides.

For $\frac{1}{4}$ in the state of free hydrochloric acid, containing traces of ammoniacal salt.

Another portion of the liquid of the masticated mass was boiled in an oil-bath at 284°F., and the product of the distillation received into a flask, contained a solution of acid nitrate of silver. From the first drop of the product there was a precipitate of chloride of silver, whose proportion went on increasing until the end of the operation, the temperature of the oil-bath rising to 356°F. The dry matter contained much alkaline chlorides.

The presence of free hydrochloric acid in the stomach of herbivorous animals, independently of the acids proper to vegetable matters, appears to us a fact so well established by other observers, and among others by the work of one of us, made in connexion with M. Le Royer, that we did not stop at this point; but Dr. Thomson having recently disputed the presence of free hydrochloric acid in the stomach, we mention these experiments, which confirm the received ideas on the subject.

OF THE PELLICLES WHICH COVER THE MASTICATED MASS.

The pellicles of the masticated mass, separated and washed, became glairy in water heated to 140° F. However, nothing was dissolved. It was the same in elevating the temperature to 212° F. The filtered liquor was not precipitated by spirit of wine, tannin, acetic acid, nor by hydrochloric acid. A few drops of very dilute caustic potassa operated the solution of this matter, especially with the aid of heat. The liquor was then susceptible of being separated by the acids. The pellicles consisted, therefore, of coagulated albumen, whose solution in water could only be effected by the intermedium of a base.

Besides these pellicles, we have frequently observed, against the sides of the stomach, white membranous substances of the same appearance as the pellicles, and which we detached from them with the greatest facility. A deposit of this nature was extracted from the stomach of rabbits, opened twenty-four hours after death, and freed from the masticated mass.

Treated by cold water, this membranous deposit rendered it acid. It dissolved neither with cold nor heat. However, the liquor was rendered slightly turbid by the hydrochloric and acetic acids, especially with heat. Tannin produced in it a coagulum soluble to a great extent by heat, and reappearing by cooling. The matter applied against the sides of the stomach was, therefore, formed of coagulated albumen, impregnated with traces of uncoagulated albumen, of free acid, and of a small quantity of gelatiniform matter. It was identical with the pellicles which enveloped the globules of the masticated mass.

The clear manner in which the separation of albumen was operated in the stomach of the rabbits, either at the surface of the globules, or against the sides of that organ, appear to us to give great weight to the hypothesis which had directed us in our experiments on the sheep. Here we found the albuminous matter pure, isolated, and ready to be passed into the small intestine. However, if the partial deposit on the surface of the globules was uniformly presented, it was not the same with the voluminous deposit on the surface of the stomach. In most cases it was completely wanting, whatever care we might take to prevent the animal being disturbed in its digestion, although we varied the time between alimentation and death. Indeed, we remarked that we regularly found the albuminous plates only when the animal had been killed a long time. It then became less probable that this separation of albumen was due to vital action. To elucidate this question, we opened the stomach of a rabbit immediately after it was killed, and after having ascertained that there was no albuminous deposit, other than that of the globules, we replaced it, after having closed it by a suture. On examining it twenty-four hours later we found a deposit of albumen resembling a false membrane, completely enveloping the masticated mass, and lining all the sides of the stomach. This experiment was decisive. *The chyme is not precipitated from the masticated mass during the act of digestion.*

However, an albuminous membrane is formed on the surface of the globules even during this act. After death, the albumen is deposited against the sides of the stomach, and is coagulated. This operation is slowly performed during and after the cooling of the body.

OF THE MATTER PRECIPITABLE BY TANNIN, AND SOLUBLE BY HEAT.

It was this substance that we found in the liquid of the cotyledons of the cow, and to which we have provisionally given the name of gelatiniform matter, although it does not crystallise, but especially because it is insoluble in alcohol, and because it produces, with tannin, a precipitate soluble by heat. We found it in the liquid part of the contents of the fourth stomach of the sheep and in the stomach of rabbits.

We also extracted a matter endowed with similar properties from the serum of blood of sheep, and from that of a pregnant woman, precipitating by alcohol the serum completely freed from albumen. One of us found, some years ago, a similar substance in the urine of a diabetic child and in two healthy urines, but in very small proportions in these last.

Recently, also, a tumor of the knee, examined by M. Calloud, contained a considerable proportion of the same substance.

Finally, MM. Tiedemann and Gmelin have remarked, in a single case, it is true, a substance which appears identical with the gelatiniform matter. They say (first volume of the French translation of their Memoir, p. 203), on the occasion of the examination of the contents of the digestive tube of a dog fed with boiled starch, that after having treated the liquors of the stomach, small intestine and cœcum, by alcohol, to remove the sugar, "the residues were treated by hot water. That of the stomach gave a brown extractive mass, susceptible of being drawn out in very fine threads, like thick mucilage. In burning, it gave out the odor of toasted bread. Its solution in water gave rise, with the tincture of galls, to an abundant precipitate, which disappeared every time the liquor was heated, and reappeared as soon as it was cold. This solution also abundantly precipitated the neutral acetate of lead, and the protonitrate of mercury. It did not act on iodine, nor on the protochloride of iron."

They regarded this substance as a modification of starch, operated in the act of digestion.*

After having detected the presence of matter possessing constant properties in the cotyledons, in the blood, and the contents of the stomachs of herbivorous animals, we were led to seek for them in the plants which serve them for food.

We shall say nothing concerning albumen, whose presence in the juice of plants is generally recognised. After having eliminated this substance, by the ebullition of the expressed juice of the vegetables composing the ordinary provender, and, after having filtered it, the liquid was evaporated to a syrupy consistence, then mixed with concentrated alcohol. A precipitate was formed which, when dried, did not attract moisture. It was brownish, had no distinct taste, and possessed the following properties:—

It was insoluble in alcohol and in ether, cold and hot. It was completely dissolved in cold water. This solution precipitated the nitrate of silver, and the coagulum disappeared by the addition of nitric acid. It also precipitated the basic, neutral and acid acetates of lead. The coagulum which it formed with tannin was dissolved by a heat of 140° F., and re-appeared by cooling. The yellow and red cyanurets of potassium and iron, the chloride of platinum, and the mineral acids, had no apparent action on this solution. It was the same with liquid chlorine, sulphate of copper, perchloride of mercury, alum, and persulphate of iron.

With the exception of the absence of action on these latter reagents all the other characters correspond to those of the gelatiniform matter. On the occasion of the examination of the liquid of the cotyledons of the cow, we remarked that the gelatiniform matter contained a small quantity of caseum. As protein, in the state of albumen or caseum, possesses the property of precipitating sulphate of copper, persulphate of iron, alum, perchloride of mercury or liquid chlorine, it may be believed that the extractive matter of the provender exerted no action on these reagents, because no caseum at all is found in it, and because it is from the juice of these vegetables that the pure gelatiniform substance may be extracted.

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* MM. Prévost and Le Royer also obtained from the liquid extracted from the first and second stomachs another substance, having the property of gelatinous.—*Bibl. Univers*, t. 27, p. 231.

The matter extracted from the juice of that plant is nitrogenous, for it burns with the odor of animal substances. By distillation it furnishes an empyreumatic oil, ammoniacal water, and a gas which forms a black precipitate in a solution of protonitrate of mercury.

We have ascertained that a substance possessing the same properties is met with in the juice of a great number of plants, which are not used as food for herbivorous animals.

The facts detailed in this memoir have taught us, relative to the nutrition of herbivorous animals:—

That we find, in the masticated mass of the sheep and of the rabbit a nitrogenous substance similar to that whose presence we have noticed in the liquid of the cotyledons of the cow:

That this substance is met with in the blood of the sheep, as well as that of man and human urine:

That it exists ready formed in the juice of all vegetables, some of which are used while others are not, for the alimentation of herbivorous animals:

That there is a partial coagulation of the albumen of the nutritive matters on the surface of the globules contained in living rabbits:

That the greatest part of the masticated mass of the rabbit is not coagulated during the act of digestion, and is precipitated only after death:

That, likewise, there is no coagulation of albumen in the fourth stomach of sheep during life, but that some is deposited after death against the sides of that organ:

The presence of uncoagulated albumen, and of the gelatiniform matter in the crude aliments, and in most of the animal fluids, admits of our regarding these two substances as performing a part of the first importance in the digestion of the herbivora, and of believing that this act has for its principal objects the extraction and absorption, without change, of these two substances.

In an early memoir we will return to the actions which the acid and the alkali exert during the act of digestion.

ON M. REISET'S OBSERVATIONS RELATIVE TO THE NEW METHOD OF DETERMINING NITROGEN IN ORGANIC COMBINATIONS, AND ON THE PART WHICH THE NITROGEN OF THE ATMOSPHERE TAKES IN THE PRETENDED FORMATIONS OF AMMONIA.*

BY H. WILL.

The method described by Varrentrapp and myself for the determination of nitrogen in organic combinations, was received with complete approbation by a great number of chemists, on account of the facility of its execution, and of the certainty and accuracy of the results which it furnishes. M. Reiset has, however, presented to the Academy of Sciences of Paris a memoir, in which he endeavors, by experiments which at first sight appear very convincing, to prove that the above-mentioned method possesses two sources of error: one of them especially, if it were real, would be sufficient to cause the employment of the new method to be completely proscribed.

The cause of this first source of error, which especially merits attention, consists, according to M. Reiset, in the nitrogen of the atmosphere taking part in the formation of ammonia in the decomposition of nitrogenous matters, and, consequently, we should always, and especially with substances very rich in carbon, difficult of combustion, and well adapted to the formation of nitrogen, find the proportion of nitrogen too high. This source of error carries along with it another, and becomes so much the more serious as, according to Faraday's investigations (*Quarterly Journal of Science*, vol. xix., p. 16), confirmed by M. Reiset, a very great number of non-nitrogenous matters give rise by fusion with the hydrated alkalis, to very considerable quantities of ammonia. In the number of these non-nitrogenous matters producing ammonia sugar especially may be mentioned, a substance of which we have proposed the addition in the analysis of very nitrogenous matters, in order to diminish the rapidity of the absorption of ammonia by hydrochloric acid.

The numerous analyses of nitrogenous substances which Varrentrapp and I have made should give, if this formation of ammonia were real, and if it were a constant source of error, a very considerable excess of nitrogen; it should especially have been remarked, in the analysis of ammeline, to which we added a weight of sugar equal to that of the substance. The accuracy and precision of the results which we obtained, with substances whose composition is very accurately known, could, therefore, be attributed only to chance, or perhaps to another source of error, exactly compensating for that just mentioned.

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* *Journal de Pharmacie*, June, 1843.

We thought, by the experiments detailed in our memoir, and in which we passed hydrogen and nitrogen over a mixture of *carbonised* tartar and lime, or *pure charcoal, soda* and *lime*, heated to redness in a glass-tube, and in which sufficient ammonia was not produced to determine it to the state of ammoniaco-hydrochlorate of platinum, to prevent all suspicion of any source of error, and so much the more as, in the mixture of soda, lime, and charcoal, the liberation of nitrogen, in the combustion of charcoal at the expense of the oxygen of the water of the hydrate, and the difficulty of its combustion presented all the conditions necessary for the formation of ammonia or cyanogen. M. Reiset appears to have forgotten that charcoal, in a state of very great division, is oxidised absolutely like an organic matter, by the action of the hydrated alkalis, and reproaches us with having neglected to show in a positive manner that the facts observed by Faraday (namely, that non-nitrogenous organic matters, such as sugar, acetate of potassa, oxalate of lime, tartrate of lead, &c., give sensible quantities of ammonia in their combination with the hydrates of potassa, soda, and baryta, in contact with the air), are without influence on the results of the new analytical process. He has undertaken this task for us; and his investigations concerning sugar or steärine have given him, by combustion with the mixture of soda and lime, in the same circumstances as for the execution of a determination of nitrogen, the following very remarkable results :—

Sugar.	Platinum obtained.	Nitrogen obtained.	Nitrogen in 108 prts.
0·250	0·02650	0·0038	1·52
0·500	0·05250	0·0075	1·50
1·000	0·0890	0·0127	1·27
1·500	0·104	0·0149	1·00
2·000	0·10725	0·0153	0·75

According to these results the quantity of ammonia which is formed would be up to *one* gramme exactly in relation to the weight of sugar employed : *a greater quantity* of sugar gives no more ammonia.

M. Reiset obtained, moreover, with one gramme of steärine, 0·06475 of platinum = 0·0092 of nitrogen, and in two other experiments on sugar, in which the combustion was operated in an atmosphere of hydrogen gas (with 1 gramme—0·03375, and 0·034 of platinum = 0·0048 of nitrogen).

From these two experiments, according to which, consequently, non-nitrogenous matters likewise give ammonia in an atmosphere of hydrogen gas, M. Reiset concludes that the alkaline mixture possesses the property of condensing nitrogen so intimately and with so much force that it cannot be completely expelled by a current of nitrogen continued for six hours, and that this state of condensation in the nascent state favours the combination of nitrogen.

In support of his observations on the defects of our method, M. Reiset also quotes the analysis of cinchovatine, an organic base discovered by M. Manzini, in the Jaën quinquina : in a case where the combustion was operated with the addition of sugar, he obtained nearly five per cent. of nitrogen more than calculation gives. Indeed, 0·502 of cinchovatine, gave 0·949 of ammoniaco-hydrochlorate of platinum = 11·95 per cent. of nitrogen.

But according to the formula $C^{49} H^{54} N^{4} O^{8}$, calculation only requires 7·16 per cent.

The excess of 4·8 per cent. here obtained represents, expressed in weight, 0·024 grammes of nitrogen, or, in volume, nearly 25 cubic centimetres. The foregoing experiments with sugar gave 0·015 grammes of nitrogen, which was, consequently, according to M. Reiset, condensed in a mixture of soda and lime, and thus took part in the formation of ammonia.

Now, if we consider that the decomposition of organic matters of difficult combustion by the hydrated alkalis is operated only at a temperature approaching redness, that, moreover, the elevation of temperature of the contents of the tube, by the charcoal with which it is surrounded, cannot be sufficiently sudden instantly to produce the heat necessary for the decomposition, but that the heat only successively penetrates into the mixture, and that it dilates and dispels a greater part of the air which is confined or condensed in it, it will be difficult to understand how it could enter M. Reiset's head that nitrogen, condensed in the mixture, can take part in the formation of ammonia. He quotes, it is true, an experiment which seems to support his opinion. The combustion of 1·500 grammes of sugar was facilitated by means of a current of atmospheric air, and in which only 0·0099 of nitrogen was obtained, instead of 0·0149. A current of pure nitrogen gas during the combustion did not increase the formation of ammonia. I shall return to this subject further on.

I have repeated and also partially modified M. Reiset's experiments, and I have arrived at very different results.

1·214 of sugar-candy of commerce, gave, by combustion with the ordinary mixture of soda and lime, without having been previously heated, by evaporation with chloride of platinum and calcination of the washed residue, 0·006 of metallic platinum = 0·00086 of nitrogen, equal to 0·07 per cent. of the sugar burned. 0·386 of pure steäric acid, obtained by several crystallisations in alcohol, gave 0·002 of metallic platinum = 0·00028 of nitrogen.

0·430 of pea-starch, obtained in the chemical laboratory at Giessen, and well washed with sulphuric acid, gave 0·005 of metallic platinum, corresponding to 0·00071 of nitrogen.

I submitted one gramme of the same starch to dry distillation; the product of the distillation was mixed with a small quantity of hydrochloric acid, and evaporated; the residue was dissolved in water, chloride of platinum was added, and evaporated *de novo*. After the treatment by alcohol and ether, there remained a quantity of ammoniaco-hydrochlorate of platinum, which left after calcination 0·004 of metallic platinum. The ammonia obtained in the combustion with the mixture of soda and lime was then at least partially contained in the starch, and was not a product of the operation.

I took for the two following experiments, (which have been absolutely executed like an ordinary combustion) a mixture of soda and lime, which had been calcined a short time before its introduction into the tube.

1·000 of steäric acid, decomposed by aid of this mixture in a tube, 0^m 487 in length and 0^m 014 in breadth left, after evaporation with chloride of platinum, and the treatment by the mixture of ether and alcohol, no sensible trace of ammoniaco-hydrochlorate of platinum.

2·000 grammes of pulverised metallic tin gave, after calcination with a mixture of soda and lime, and treatment of the hydrochloric acid evaporated with chloride of platinum by alcohol and ether, an extremely small quantity of a yellow powder, which acted like ammoniaco-hydrochlorate of ammonia.

In the following experiments during the successive oxidation of the matter of the hydrated alkali, I passed a current of atmospheric air or nitrogen through the tube. The atmospheric air and the nitrogen were dried by sulphuric acid, which had been freed from deutoxides of nitrogen by heating with protosulphate of iron.

The volume of the gaseous current was most frequently raised to 3000-4000 cubic centimetres, and the combustion was, during the two or three hours that the experiments lasted, conducted from the anterior to the posterior part of the tube in such a manner as to present at each moment the conditions for the formation of ammonia.

4·000 grains of perfectly pure sugar, submitted to several crystallisations, were heated to redness with a great quantity of the mixture of soda and lime, used in a tube of 0·812 inches in length, in contact with a current of air, and gave no trace of ammoniaco-hydrochlorate of platinum.

Twenty grains of ordinary pulverised metallic tin were oxygenised in the same manner, by the mixture of soda and lime, and gave an imponderable quantity of a yellowish powder. The oxidation of tin, at the expense of the hydrated alkali, was demonstrated by the uninterrupted disengagement of hydrogen.

4·300 grains of sugar, purified by several crystallisations, were introduced, little by little, by the tubulure, into a retort containing hydrate of soda in fusion, the neck of which was obliquely raised.

To the absorption apparatus, put in communication with the retort, was adapted an aspirator, so that the gaseous matters formed, following the current of air, should traverse hydrochlorac acid. I thus obtained only a very slight trace of ammoniaco-hydrochlorate of platinum. The same experiment repeated with tin, zinc, and pure metallic iron, always furnished this salt, but in such slight traces, that, in most cases, I could not weigh it.

By substituting the hydrate of potassa for that of soda, I always obtained chloride of platinum and potassium, because the tumultuous disengagement of hydrogen carries along with it parcels of alkali into the hydrochloric acid.

In another experiment 20 grains of metallic tin were heated to fusion with recently fused hydrate of soda, in a tube slightly curved into the form of the letter U, passing into it a current of atmospheric air, in such a manner as always to put, throughout the duration of the experiment, fresh quantities of air in contact with the hydrogen disengaged. I thus obtained 0·008 of ammoniaco-hydrochlorate of platinum = 0·00057 of nitrogen. An experiment with nitrogen instead of atmospheric air gave a similar result—namely, 0·007 of ammoniaco-hydrochlorate of platinum.

These experiments evidently show that the nitrogen of the air cannot, in any way, combine with nascent hydrogen to form ammonia. The extremely small quantity of this alkali obtained in most cases must, then, have another source, but it would appear very difficult to be screened from it: I succeeded, however, in the following manner:—

I fused hydrate of soda in a silver crucible until it was in tranquil fusion, and I then mixed with it a small quantity of pure iron (arising from the reduction of the oxide by hydrogen); this metal was easily oxidised, giving rise to a disengagement of hydrogen. It was transferred to a perfectly clean and previously heated silver crucible; after cooling, I broke it into pieces in the latter, then I introduced it into a refractory glass tube slightly curved, and previously heated to redness, and immediately added to it four or five grammes of pure iron reduced by hydrogen; I then raised the temperature of the tube by burning charcoal and passed into it nitrogen or air. The first current of air ordinarily presented an extremely slight proportion of ammonia by the contact of humid dahlia paper, or of a glass rod, moistened with dilute hydrochloric acid; but this disengagement of ammonia was perceptible only for a short time, and it always ceased before the commencement of the oxidation of the iron with a disengagement of hydrogen. When this commenced, I adapted the absorption apparatus, and I kept the alkali in fusion until all the metal was oxidised. By exactly observing these precautions, I never obtained ammoniaco-hydrochlorate of platinum.

I repeated the same experiment, with a similar result, on perfectly pure, crystallised tin, such as may easily be obtained by suspending a rod of polished tin in a cylinder into which a small quantity of water, acidulated with a little hydrochloric acid, is poured on a concentrated solution of tin. At the end of one or two days, a magnificent crystallisation of metallic tin is formed. If the metals be touched with the fingers before the experiment, or if they be left exposed to the air, a disengagement of ammonia is always remarked; but it is not so when they are heated a short time previously, as well as the hydrated alkali. Pure tin is only very difficultly oxidised by hydrate of soda; it may be kept for some hours in fusion with the latter substance, without its oxidation being completed.

(To be concluded in our next.)

ON THE ORIGIN OF SULPHUR IN VEGETABLES.*

BY M. HURAUT.

Besides carbon, hydrogen, oxygen, and nitrogen, which are considered as the only truly organic elements of vegetables, several plants, and especially those which belong to the family of cruciferæ, also contain sulphur as a constituent principle. Although this fact, which is in a high degree interesting to physiology, has long been known, the works which have of late years been published concerning this part of natural history have made no mention of it. This omission is so much the more to be regretted, as in these works, otherwise so remarkable, the highest questions of natural philosophy are treated in a quite new point of view, according to which the organisable elementary principles of vegetables perform in it the most important part.

It is only quite lately that Dr. Vogel, senior, of Munich, called attention to this subject, by publishing the experiments which he made on one of the plants, the *Lepidium sativum*, which contains the most sulphur.

Until then, the origin of this simple body in plants was explained by admitting that the soil in which they were developed, contained either free sulphur (which is the case only in volcanic soils), which they directly assimilated, or sulphates, which, after their absorption, were decomposed, under the influence of the organism, in such a manner that sulphur, which they appropriated to themselves, resulted. But this hypothesis, which may not be impossible when plants which are strongly disposed, like the cruciferæ, to assimilate sulphur, are found in a soil which contains that substance in the state of freedom or combination, becomes insufficient since the investigations of Dr. Vogel.

It results, indeed, from the investigations of this learned physiologist, that young plants of *Lepidium sativum*, which had germinated in a soil formed solely of quartz and finkglass, reduced to a coarse powder, of ground glass, calcined and washed with boiling water, or even also of silica, arising from the decomposition of fluosilicic gas by water, and consequently free from sulphur and sulphates, contained fifteen times more sulphur than a weight of seeds equal to that which had served for their production.

M. Vogel has endeavored to account for the great quantities of sulphur existing in the plantules of *Lepidium*, which he had submitted to analysis; but as their growth was operated, not only in a soil which contained neither sulphur nor sulphates, but also in a room sheltered from all contact with sulphurous vapors, this fact is an enigma of which, for the moment, he was unable to give a satisfactory explanation.

Among the precautions taken by M. Vogel to avoid, in his experiments, the presence of any sulphurous vapors whatever, there is an important, and, in our opinion, an essential one, which he has totally forgotten, that of depriving the air, in which his seeds of Lepidium were developed, of sulphuretted hydrogen, and which, like carbonic acid, ammonia, and protocarburetted hydrogen, forms a constituent part of the atmosphere.*

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* *Journa de Pharmacie*, May, 1843.

In support of this assertion, I will briefly recapitulate the principal circumstances in which sulphuretted hydrogen is produced, as well as some of the phenomena to which its presence in the atmosphere gives rise.

Sulphuretted hydrogen gas is constantly, and sometimes in considerable quantity, disengaged from the mineral waters called sulphurous; it is one of the products of the putrefaction of vegetable and animal substances, as also of the decomposition which certain metallic sulphates undergo in contact with water and easily oxygenisable organic matters.

The grey tint, then black, which all oil paintings acquire in the air; the alteration which the metals, such as gold, silver, and copper, undergo in contact with this same agent, either in their colour or in their texture;† the brown coloration and afterwards the black precipitate caused in the solution of a salt of lead, for a long time traversed by a current of air, are phenomena due to the sulphuretted hydrogen contained in the air.

The presence of this gas in the atmosphere being once admitted—and I think it cannot be disputed—nothing is more easy than to explain the origin of sulphur in vegetables; sulphuretted hydrogen, the same as carbonic acid and ammonia, is absorbed by the plants, then, under the influence of the forces which preside over vegetative life, decomposed in to these elements, which are assimilated or rejected according to necessity.

According to that, sulphuretted hydrogen becomes a gas as essential to the life of certain beings of the vegetable kingdom (and perhaps of all, if, as some chemists admit, sulphur be one of the constituent principles of albumen), as carbonic acid and ammonia are to the existence of all.

The investigations of Dr. Vogel are of high importance to physiology, not only because they confirm the experiments of the chemists who, before him, announced the presence of sulphur in vegetables—this fact had been observed too often to be doubted—but indeed because, quite indicating the true source from which all plants derive the sulphur of which they have need, they furnish a new proof in favor of those very simple and admirable laws which, according to certain physiologists, govern organic matter. It is thus, for example, that it will always be possible for us to apply to one of the greatest phenomena of life, the beautiful idea of M. Dumas, so true in its principles: "That which animals give to the air, vegetables take from it, so that to take these facts in the highest point of view of terrestrial physics, it must be said, that, as regards their truly organic elements, the plants the animals derive from the air are only condensed air."

The existence of sulphuretted hydrogen in the atmosphere, it appears to me, should also lead to the explanation of a phenomenon which has already several times fixed the attention of philosophers; I allude to the sulphurous odor always manifested where lightning flashes. It may be conceived that when an electric spark passes through the air, sulphuretted hydrogen, which is formed in its passage, is decomposed into its elements, which on account of the high temperature to which they are exposed, combine with the oxygen of the air, forming water and sulphurous acid. It is this acid that produces the sometimes very penetrating odor of burning sulphur which is remarked after each explosion. I now confine myself to this single indication; I shall hereafter return to this subject to give it all suitable development.

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* Hitherto, the presence of protocarburetted hydrogen (marsh gas) in the air, has not been directly demonstrated; it is only by induction that M. Boussingault has been led to admit this gas among the constituent principles of the atmosphere. I thought it right to act in the same manner with regard to sulphuretted hydrogen, because the considerations adduced in favor of the existence of this body in the air, appear to me, at least, as plausible as, if not more so than, the consequences which have served to prove that of marsh gas.

† Gold, silver, and especially copper, when long exposed to the air, undergo an evident alteration, due to the formation of a sulphurete of these metals. Thus gold is tarnished and takes a color more and more brown; silver becomes yellow at first, then brown, and afterwards black; it is the same with copper, whose alteration is much more prompt and more evident. A remarkable instance of this kind of alteration is recorded. The point, which was entirely formed of copper, of the arrow of a lightning conductor surmounting one of the edifices of Paris, was found completely converted into sulphuret of copper.

REPORT ON A MEMOIR BY M. E. MARCHAND, ON THE ALTERATIONS OF THE ORGANIC ALKALIS, IN CONTACT WITH, AND UNDER THE INFLUENCE OF, OXYGEN IN THE NASCENT STATE.*

BY MM. BOULLAY AND BOUCHARDAT.

M. E. Marchand sent to the *Societè de Pharmacie* a memoir, the fruit of numerous observations on the action of oxygen in the nascent state on several organic bases.

In all the experiments which form the subject of his memoir, M. Marchand always had recourse to the peroxide of lead under the influence of water, acidulated with sulphuric acid, in order to promote the reactions, and the organic alkalis on which he operated were cinchonine, quinine, strychnia, brucia, morphia, and narcotin.

The study undertaken by M. Marchand presents serious difficulties. Several chemists had previously attempted it. Pelletier was especially preoccupied with it in his memoir on the action of iodine on the vegetable alkalis. Indeed, iodine, in reacting on the vegetable alkalis, furnishes, not as Pelletier stated, iodides of the vegetable alkalis, but iodides of hydriodates. By causing potassa to react on these bodies an equivalent of iodine displaces an equivalent of oxygen from the potassa, and this oxygen goes to the organic base to oxidise it. Unfortunately the reaction is not so clear as theory seems to indicate. It is not an oxide of a vegetable alkali that is obtained, but a mixture of the vegetable alkali itself with several products of oxidation, which hitherto have not been isolated in the pure state and perfectly studied. Has M. Marchand been more fortunate? We fear not; for all the products which he obtained do not crystallise, have not accurately defined solubilities, do not fuse at fixed temperatures, and, in a word, do not present any of the characters of pure principles. Be this as it may, the extract which we give from M. Marchand's work, proves that it contains interesting facts.

By the oxidation of cinchonine, M. Marchand obtained a coloring matter, which was presented under the form of an amorphous mass of a very deep violet color. The author gives to the product a peculiar name (cinchonetin), which seems to us premature.

Under the same oxidising influence, quinine gives two distinct products:

1st. A substance of a blood-red color, of a bitter taste, soluble in water, in alcohol, and in ether; it dissolves without alteration, and retains its color in sulphuric and nitric acids.

2nd. A substance insoluble in water, soluble, on the contrary, in alcohol and ether. When it is obtained by the spontaneous evaporation of its alcoholic solution, it is presented in the crystalline state, and its crystallisation is analogous to that of hematin. Its solutions in alcohol and ether are violet. It furnishes a red solution with dilute sulphuric acid.

M. E. Marchand obtained as an ultimate product the oxidising action, a mixture containing an acid which he has not characterised.

Strychnia in solution in water acidulated with sulphuric acid, submitted to the oxidising influence of peroxide of lead, furnished by the cooling of the filtered liquors, a powder of a dirty yellow color, insoluble or very sparingly soluble in cold water, soluble in a large quantity of boiling water, and soluble by heat in water acidulated with sulphuric acid, but precipitating on cooling, insoluble in ether, extremely sparingly soluble in alcohol. The best solvent of this powder is the solution of caustic potassa which it seems to neutralise.

It is to be regretted that the author has not made a more profound study of this interesting product.

Brucia, submitted to oxidation under the influence of peroxide of lead, gave a solution which evaporated, furnishes a matter of a fine red color, partially soluble in boiling alcohol of 90°.

When morphia is submitted to the same reaction as the foregoing bases, it furnishes a reddish yellow liquid, which, by evaporation, gives a matter, soluble very in distilled water. The solution reddens litmus, and is very sparingly soluble in alcohol.

The products resulting from the oxidation of narcotin are of two orders:—1st, a brown coloring matter, very sparingly soluble in ether, very soluble, on the contrary, in water and alcohol; 2nd, opianic acid, studied by Liebig and Wöhler.

If, now, we consider, in a general manner, the results of the influence of oxygen in the nascent state on the vegetable alkalis, we must admit three distinct phases in these reactions.

First Degree of Oxidation.—The alkaline character of the organic bases is not destroyed; they are converted into new and more highly oxidised alkalis. This assertion, first made by M. Pelletier, then by M. Dumas, has been the subject of a great number of experiments performed by one of us.

Second Degree of Oxidation.—It is then that those different coloring matters are obtained which M. E. Marchand has especially studied.

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* *Journal de Pharmacie*, July, 1843.

Third Degree of Oxidation.—The oxidising action being exhausted we obtain acid matters—for example, opianic acid.

If the results hitherto remarked do not present all desirable clearness it is doubtless owing to the difficulty which experimentalists have experienced in separating the products of these complicated reactions.

ON THE INFLUENCE OF TEMPERATURE ON THE PRODUCTION OF IODOFORM, AND ON THE OCTOHEDRAL CRYSTALLISATION OF IODIDE OF POTASSIUM.*

BY A. BOUCHARDAT.

Many examples of the influence of temperature on chemical reactions are known ; I am about to mention a new fact which appears to me worthy of notice. It is known that Serullas discovered iodoform in causing the tincture of iodine to act on an alcoholic solution of potassas. This means of preparing this interesting product is very costly. In a memoir in the *Journal de Pharmacie*, vol. xxii, in which I examined several analogous products, I pointed out some modifications which might be introduced into the process of preparation indicated by Serullus for obtaining iodoform. I have given in my formulary a process which is economical, and easy of execution. In recently repeating these various experiments, I have made some unexpected remarks, which I am about to publish.

If, to slightly alcoholised water, containing iodide of potassium, iodine and potassa be alternately added and in sufficient quantity to decolor and again color the liquor, it is heated; acetic ether and iodoform are produced, without traces of iodate of potassa.

But if, instead of this, iodine be dissolved in alcoholised water holding iodide of potassium in solution, if we add to this mixture an aqueous solution of potassa in sufficient quantity to decolor the liquors ; if, then, more iodine be added, and always successively potassa in insufficient quantity for obtaining decoloration, then no trace of iodoform is produced. The oxygen which the iodine displaces from the potassa goes to the alcohol, converting it into acetic ether, which may be easily isolated ; but the action goes no further ; as soon as all the alcohol is converted into acetic ether, the displaced oxygen goes to the iodine, producing iodate of potassa, which is deposited.

Thus, under the influence of an excess of iodine at the ordinary temperature, there is no production of iodoform by the mutual reaction of iodine on alcohol : under the influence of potassa, acetic ether is then alone formed.

Again—if to an aqueous solution of carbonate of potassa we add alcohol, iodide of potassium, and iodine in excess (the alcohol should not be in such proportion as to separate the saline solution), and if the mixture be subjected to a temperature of 140° F., after a few hours, an abundant production of iodoform is remarked, the iodine always remaining in excess.

It was a long time before I was able to account for this difference of action in circumstances which seemed so concordant ; I did not understand how, all things being apparently equal, with caustic potassa I obtained acetic ether, and nothing but acetic ether ; whilst with carbonate of potassa iodoform was produced.

After several fruitless endeavours to ascertain the cause of the difference, I arrived at saying, but with the corbonate of potassa to favor the reaction, I am forced to employ a temperature of 140° F., whilst with more potassa I acted at a temperature of from 59 to 68° F., should this temperature have so decided an influence on the progress of the reaction ? I then raised a solution of iodine and iodide of potassium in alcoholised water, to a temperature of 140° F. I then added to the mixture a solution of caustic potassa, and I immediately observed the formation of iodoform. Thus, then, this clear and decided difference between the reactions depends only on the differences of temperature.

Before the cause of the phenomenon which I have just noticed was made known to me, I made several experiments which led to nothing ; but one of them furnished a result independent of the cause which I sought for, and which presented no less interest.

By evaporating the saline solution, containing iodine, iodide of potassium, and acetic ether, I obtained semi-transparent octohedral crystals of a light color. These crystals, heated in a tub, furnished a few traces of iodine ; the fused residue consisted only of iodide of potassium.

I prepared a solution of biniodide of potassium ; this solution, spontaneously evaporated, furnished the same octohedral crystals.

In order to obtain octohedral crystals, the presence of a great excess of iodine during the crystallisation is indispensable.

These crystals do not consist of a definite combination, for the proportion of free iodine is extremely small ; it is not equal to $\frac{1}{1000}$ But it is curious to see iodide of

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[*] *Journal de Pharmacie*, July, 1843.

potassium lose its predominant form under the influence of a small quantity of iodine.

It appears to me probable that this fact is more general than is supposed, and many bodies affect different forms, or forms derived from the dominant form, on account of the mixture of some portions of substances foreign to their definite constitution.

ON THE ACTION WHICH IODINE EXERTS ON THE OXIDES BY THE INTERMEDIUM OF WATER, AND PARTICULARLY ON THAT WHICH IT EXERTS ON OXIDE OF LEAD.*

BY M. JAMMES.

Iodine presents, as is known, in its *modus operandi* with various agents, so much analogy to chlorine and bromine, that whenever we obtain a series of chlorous combinations, we are naturally led to investigate whether bromine or iodine would furnish in the same circumstances analogous compounds.

Some experiments which I made a long time ago, led me to think that the action of iodine on the oxides had more analogy than was supposed to that which chlorine exerts on them (through the intermedium of of water).

In endeavoring to isolate iodous acid whose existence has been presumed, without, however, having put it beyond doubt, I was led to make iodine act on various oxides, and I arrived, in the course of my investigations, at the discovery of some new facts. I expected to have terminated the study of the action of iodine on several oxides, and I should have published nothing on this subject if the discovery of a blue compound of iodine and oxide of lead, recently announced by M. Durand, had not decided me on publishing a part of my work in which the action of iodine on oxide of lead, through the intermedium of water, is examined. I had several times, long before the publication of M. Durand's memoir, made iodine act on oxide of lead in water, sometimes cold, sometimes with heat; I only once obtained the blue compound which he procured; but for a long time I endeavored to reproduce it without being able to do so, although I was placed in circumstances apparently similar to those in which I first obtained it. However, as I shall show further on, the compound which I obtained may, by aid of a little art, be converted into that observed by M. Durand.

If we put iodine in contact with water and litharge, without heat, there is little or no action, as M. Gay Lussac states. It is the same with massicot. These oxides have too much cohesion to be able to act on iodine. With heat there is likewise little or no action: the iodine is volatilised without combining with the oxide.

If we take pure hydrated oxide of lead, and thoroughly free it from the subsalts which accompany it after its precipitation, we obtain, without heat, in a few seconds, a compound of a pale violet, almost vinous, or slightly reddish; but the blue compound is never obtained.

This powder of a vinous color is only slowly decomposed at the temperature of boiling water; so that, after having obtained this compound of iodine and oxide without heat, the excess of iodine may be driven off by ebullition. When the aqueous vapors are disengaged pure, the compound may be collected, washed several times, and dried out of contact with the air.

This powder is slowly altered in the air, without losing an appreciable quantity of iodine; however, it absorbs carbonic acid with rapidity.

Strongly heated, it disengages oxygen, and gives a residue of iodide of lead.

Alcohol does not remove iodine from it, which proves that the latter is really in combination.

Boiling water removes a few traces of iodide of lead, but in a scarcely appreciable quantity.

The acids decompose it with a disengagement of iodine.

The analysis of this powder led me to regard it as a compound in definite proportions, containing iodine and oxide of lead.

The following is the result of some analyses:—

DETERMINATION OF THE LEAD.

1st Analysis.—	Matter employed	0·793	Oxide per cent. 83·94
	Sulphate of lead obtained	0·905	
2nd ,,	Matter employed	1·355	Oxide per cent. 83·60
	Sulphate of lead obtained	1·540	
3rd ,,	Matter employed	0·624	Oxide per cent. 83·92
	Sulphate obtained	0·712	

These analyses were made by putting the powder into a platinum capsule carefully weighed, adding sulphuric acid, and heating with caution. The iodine was eliminated, and the lead remained in the state of sulphate.

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* *Journal de Pharmacie*, May, 1843.

DETERMINATION OF THE IODINE.

1st Analysis.—	Matter employed	2·840	Iodine per cent. 16·12
	Iodide of silver obtained	0·850	
2nd ,,	Matter employed	2·480	Iodine per cent. 16·28
	Iodide of silver obtained	0·752	
3rd ,,	Matter employed	2·317	Idoine per cent. 16·29
	Iodide of Silver obtained	0·702	

To determine the iodine, I dissolved the compound in pure caustic potassa; the solution having been saturated with dilute sulphuric acid, all the lead was precipitated in the state of sulphate, and the iodine remained in solution in the liquor in the state of iodate and iodide. The liquor was evaporated to dryness after having been properly neutralised, and the residue calcined in a porcelain crucible in order to convert the iodate of potassa into the iodide; the latter being dissolved in distilled water, served for producing the iodide of silver.

This powder is completely soluble in caustic potassa. It appears to contain six equivalents of oxide of lead to one of iodine. The intimate constitution of this compound does not appear to me easy to explain, at least, unless it be really considered a compound of iodine and oxide of lead.

The numbers which these analyses furnish approach those which we should have, supposing this compound to have the formula $I^2 + 6PbO$; for we should have in this hypothesis:—

	Calculated.	Found.
Oxide of lead	84·12	83·82
Iodine	15·88	16·23
	100·00	100·05

There exists between the calculated and found results a difference too great to be regarded as accidental; and as this difference has always been uniformly the same in my analyses, I have thought that it might be explained in the following manner:—When iodine acts in contact with water, there is formed, independently of the above compound, a little iodide, and probably a little iodate of lead which the washings do not entirely remove. The mixture of these two compounds should necessarily give in the analysis of iodide of oxide a loss of oxide of lead; and, on the contrary, an excess of iodine. Be it as it may, the uniformity of the results which I have obtained, leads me to consider the compound as formed of one equivalent of iodine combined with six of oxide of lead, and mixed with a little iodide and iodate of lead.

I have prepared it several times, and I have always found its composition identical. It is easy to procure it by putting pure and still moist hydrated oxide of lead, with a little recently prepared tincture of iodine. Iodine in powder also succeeds well; but the action is rather slower; besides, the uncombined iodine may be removed by washing with alcohol.

To obtain M. Durand's blue compound, it is sufficient to add to the above mixture, a few drops of a solution of nitrate or acetate of lead; the existence of a subsalt of lead is indispensable to its production. This blue compound must, therefore, have a more complicated composition than M. Durand thinks; for it appears to me certain that the subsalt of lead enters into its composition. I have not yet analysed it; but I shall shortly be able, I hope, to make known the results of the analysis of it with which I am now engaged.

CRYSTALLISED OXIDE OF LEAD.*

BY W. BEHRENS.

M. Houton Labadilliere found that oxide of lead dissolved in a solution of caustic soda, and exposed for some months to the air, crystallises from this solution under the form of white dodecahedrons. I accidentally obtained the same crystals, but of a yellowish color, by means of another method.

I mix an aqueous solution of neutral acetate of lead with a great excess of a solution of caustic ammonia; then I separate, by filtration, the carbonate of lead formed by the carbonic acid of the water or of the ammonia; and finally I expose the limpid liquor in a well corked glass to the action of the sun's rays.

At the end of a few hours, small transparent crystals are formed; at first, they are colorless, but gradually become yellowish and yellowish grey. They give an almost white powder, which, pounded for some time, becomes of a deep red brown, like litharge; in general they act like pure oxide of lead.

If the same liquor be put in the dark, for example, in the cellar, after some days, crystals of acetate of lead with five equivalents of base are obtained, grouped in stars, instead of oxide of lead.

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* *Journal de Pharmacie*, July, 1843.

ACTION OF CHLORINE ON CARBURET OF SULPHUR.

To the Editors of the Chemist.

Gentlemen,

In No. XLIII. of your excellent journal there is a paper "on the action of Chlorine on Carburet of Sulphur," by Heinrich Kolbe, in which he points out that at the ordinary temperature these bodies act upon each other and produce chloride of sulphur, and a new compound, hitherto unknown, of carbon, sulphur, and chlorine.

I beg to inform your readers that I obtained this compound in May, 1837, in the laboratory of Professor Low, Craigleith House, near Edinburgh, whilst endeavouring to produce a chloride of carbon, by transmitting chlorine (dried by passing over calcia) through the liquid called bisulphuret of carbon. I continued the transmission for thirty hours, and obtained a dark red liquid, similar in appearance to dichloride of sulphur.

This compound was agitated with water, which decomposed the dichloride of sulphur, and there remained under the water a transparent oily liquid of a golden yellow color, having a remarkably pungent and peculiar odor, and irritating the eyes very much. Mercury seemed to have the same effect of decomposing the dichloride and leaving the chloride.

Potassium decomposed it with the evolution of heat and light, chloride and sulphuret of potassium being dissipated by the intensity of the action, and carbon left. From this analysis I regard the compound as a chloride of the sulphuret of carbon, and, therefore, a new compound.

The action of potassa led me to a different result from that of Kolbe. He obtained carbonate of potassa, 2 equivalents of sulphuret of potassium, and quadrochloride of carbon, which, supposing it to be a compound of $C^2 S^2 C^{14}$, and acting upon 3 equivalents of oxide of potassium, certainly might take place. But having in my experiments obtained, after agitating with potassa, a liquid having the same smell and without color, like the bisulphuret I originally employed, which was not affected by a solution of nitrate of silver, and considering that I had obtained a considerable portion of chloride of sulphur, I was led to the opinion that the compound called bisulphuret of carbon was not a definite compound, but a sulphuret of carbon with sulphur in solution, which could not be separated from it by distillation.

It dissolves both iodine and phosphorus, and burns with a blue flame like the bisulphuret. I used to keep it under water.

The above are the memoranda upon this compound, which I have extracted from my notes taken six years ago.

I have the honor to remain,
Gentlemen,
Your very obedient servant,
William Glass.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

IMPROVEMENTS IN PAINTS, OR PIGMENTS, AND VEHICLES; AND IN MODES OF APPLYING PAINTS, PIGMENTS, AND VEHICLES.*

PATENT GRANTED TO MESSRS. SPILSBURY, CORBAUX, AND BYRNE.

This invention consists in using soluble vehicles for applying paints, or pigments, which vehicles, by a subsequent application of chemical agents or reagents, are rendered insoluble in water, and thus admit of paint or pigments so applied, and so fixed, being afterwards washed with water, or soap and water, in order to keep them clean; and this invention will, at the same time, admit of paints or pigments, and vehicles so employed, being applied for the most elegant purposes of house and such-like painting, and also to the purposes of the artist, and for printing paper and other fabrics; and, at the same time, they will not emit that disagreeable smell consequent on using oils or spirits, or varnishes produced therewith, combined with paints or pigments.

In painting there are few coloring matters or pigments which are used alone, but they are generally employed as coloring substances to what may be called a body pigment; and, in most instances, white lead (carbonate of lead) is used when oils, or spirits, or varnishes prepared with them, are the vehicles, and the colored pigments are mixed therewith, in order to produce the color, or tint of color, desired. Hence, in any mode of compounding pigments for the purposes of being applied as paint, it is important to have a good and cheap white pigment which can be obtained in large quantities; and, for such purposes, sulphate of lime, sulphate of baryta, argillaceous earths, or other white pigments (which should be free from iron) may be used.

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* Newton's *London Journal, and Repertory of Arts, Sciences, and Manufactures.* August, 1843.

It is well known that many chemical agents, when brought in contact with gelatine or with albumen, in solution, coagulate them, and such coagulated substances when dry are insoluble. This is the case with other matters hereafter described, which the patentees employ (as well as gelatine and albumen) as the soluble vehicles for mixing with pigments in order to their being used as paints; and by the subsequent application of chemical agents, such vehicles are rendered insoluble, and the paints or pigments are fixed or set.

When gelatine is used as the soluble vehicle, alum is employed (by preference) as the fixing medium; and it should be stated, that as most of the paints or pigments will be found to be more or less acted on by the chemical agent employed for fixing or rendering the soluble vehicle insoluble, it is important that the pigment (previous to being mixed with the vehicle employed) should be subjected to the action of the chemical agent, which is to be afterwards used in fixing the vehicle or paint. Thus, supposing the pigment intended to be used be an earth, and the chemical agent alum, then the earth is submitted to the action of alum, by mixing and washing it with a cold saturated solution of that substance; and, subsequently, by repeated washings, to remove the undecomposed alum therefrom, it will then be in a proper state to be ground up with the gelatine and water.

Small pug-mills are employed for the purpose of mixing, and for immediate use, it must be reduced to the proper consistence with soft water, and then laid on the surface in the same manner as ordinary paints, each coat being allowed to dry before another is laid on. When one, two, or more coats have been applied, according to the desire of the painter, and become dry, the same are to be fixed by applying a cold saturated solution of alum, or such other chemical agent as may have been determined on; by this means the paint on the surface will be fixed, and insoluble in water. It is only requisite to remark, that in using colored pigments, they also should be first treated with the alum or chemical agent to be employed in fixing the vehicle, as above described, in order to prevent any injurious action taking place, in respect to the color and to the pigment itself, which, in many instances would be the case, were such pigments used without preparation, and, subsequently, brought in contact with the chemical agent used for fixing the paint.

Albumen may be used in place of, or in conjunction with, gelatine; and the use of albumen is recommended for the purpose of the artist, where the cost will not be considered an object: but, for general purposes, gelatine is preferred, because less expensive.

The method of preparing pigments which are required to be kept a considerable time, is as follows:—

To make white paint:—Take 160lbs. of sulphate of lime or sulphate of baryta, or white earth, well washed, in order to separate all foreign matters, as is well understood, and which had been treated with the chemical agent, as above explained; mix therewith about 20lbs. of solid gelatine, and about 14lbs. of sulphate of zinc (any other suitable material for preserving the gelatine from decomposition may be used), dissolved in 160lbs. of warm water. This compound is made into a very thick paste, and packed in small casks; or it may be dried with or without sulphate of zinc, or other preservative; or the dry pigment may be prepared or mixed with dry gelatine or albumen.

It should be stated that the means of preserving gelatine heretofore most generally adopted—namely, by the employment of sulphurous acid, acetic acid, and alum—are not proper for the purpose of this invention: those materials which the patentees prefer using, are, sulphate of zinc, or other soluble salts of zinc, the soluble salts of magnesia, or the soluble salts of lead.

When the pigment is to be tinted or colored, the white pigment employed is to have colored pigments combined or intimately mixed with it, in order to produce the desired tint of color; unless the colored pigments are to be employed alone, which is seldom the case in coloring or painting, and such colored pigments are to be first treated with a cold saturated solution of alum, or other material, which is intended to be afterwards employed in fixing the soluble material, by rendering it insoluble.

Another part of this invention relates to a like mode of employing other soluble vehicles for pigments, in which the vehicles are to be afterwards rendered insoluble by alum or other known chemical agents; these vehicles are formed by dissolving resinous matters in a solution of borax, or in an alkaline ley, and by dissolving wax in an alkaline ley. The first kind of vehicle is made by combining well-bleached shellac and borax together, in the proportion of five pounds of the former to one of the latter, and boiling them with about four gallons of water, until dissolved. The pigments are ground with this vehicle to the proper consistence of paint, and laid on in the usual way; when dry, they are washed over with a solution of alum or other chemical agent which is known to destroy the combination of the lac and borax, and to render the lac insoluble.

The second kind of vehicle is produced by mixing equal parts, by weight, of white wax and caustic soda ley, of specific gravity 1·04, and boiling the mixture for several hours, adding water in the proportion of half a gallon to every pound of wax, after the solution is effected. The patentees also prefer to add four pounds of dry starch, calcined or uncalcined, to each pound of wax. To this vehicle is to be added as much of such pigments,—which are found by being previously tested not to be prejudicially acted on by an alkaline solution,—as will bring it to the consistency of honey, and the mixture is then reduced to a proper state for painting by the addition of soft water. When the surface painted with the mixture or pigment is dry, it is washed over with a solution of alum, or any other chemical agent that will destroy the combination of wax and alkali, leaving the wax insoluble in water. It is obvious that the above vehicles may be used in conjunction with each other, as well as separately.

Another mode of employing gelatine, and the other vehicles described for fixing pigments, is to apply a coating of either of the vehicles over a painted or printed surface, and afterwards to fix the vehicles by a chemical solution, as above described. By this means pigments may be set without the necessity of combining the above-mentioned vehicles with them, previous to use. In some cases, the sulphate of zinc or other preservative material, is mixed with the pigments, as described above, but without any vehicle which is supplied by the painter previous to using the pigments. The object of this mode is to enable the mixture with gelatine when made, to keep a reasonable time in hot weather, and at the same time that by these not being mixed until wanted, the pigments may be kept an unlimited time. This mode of preparation is particularly applicable for hot climates.

When the pigments and vehicles, prepared as above described, are used for printing and painting paper and other fabrics, as well as other surfaces, a small quantity of dissolved starch should be added to the solution of alum employed as the fixing material, by which means the solution will be caused to work better, and will not be liable to run while being laid on.

The last part of this invention consists in employing certain vegetable matters in the preparation and application of paints or pigments. For this purpose, the glutinous or adhesive products of vegetable matters generally will do, but the patentees prefer gluten, albumen, gums, and mucilage, using them either separately or in combination with other products usually found therewith. For example—a mixture of flour and water is made in such proportions, that when boiled, it will be about the consistence of cream, and with this mixture the pigment is ground to the state of paint, with or without sulphate of zinc or other preservative. This paint or pigment, if necessary, is reduced with water, and is then laid on in the usual manner, and, when dry, it is fixed by the application of a suitable chemical agent or reagent, such as silicate of potassa or soda, commonly called liquor of flint.

Another mode of carrying out this part of the invention consists in mixing any quantity of dissolved tragacanth, of the consistence of linseed oil, with as strong a solution of silicate of potassa or soda as will not injure the color which is employed. With this mixture, the paint or pigment is brought to a proper consistence for working, and is then applied in the usual way to surfaces; and, when thoroughly dry, it will be insoluble in water.

The claims made by the patentees are as follow:—

1. The mode of employing paints or pigments and soluble vehicles (gelatine and albumen), by afterwards rendering such paints or pigments and vehicles insoluble, as above described.

2. As a new manufacture, the combining pigments with gelatine and albumen, in a dry mass, or in a paste, with suitable materials, for preserving the latter from decomposition, in order to allow the paints or pigments, so prepared, being transported from place to place, without detriment to the color, which, when required to be used, is rendered liquid, by hot soft water, when gelatine is used as the vehicle, and cold soft water when albumen is employed.

3. As a new manufacture, the mode of preparing pigments with resinous matters or wax, dissolved in an alkaline ley or solution of borax, made into a thick paste (or dry), and thus to allow of the prepared pigments being transported from place to place, and only requiring hot soft water to liquify it for use.

4. The mode, herein described, of applying pigments, paints, and soluble vehicles (wax or resinous matter dissolved in an alkaline ley or borax), by afterwards rendering such paints or pigments and vehicles insoluble, as above described.

5. The mode of combining soluble salts

of zinc, magnesia, and lead with gelatine, in order to preserve the same.

6. The mode of combining soluble salts of zinc, magnesia, and lead, with pigments, as hereindescribed.

7. The mode, herein described, of preparing and applying paints or pigments, and vegetable products, by rendering such paints or pigments and vehicles insoluble as above described.

8. The combining pigments with vegetable products, and preserving materials, as above described.

9. And lastly, the mode of preparing pigments or paints, and vegetable products, with silicate of potassa, or soda, or other materials, having the property of rendering the painted surface insoluble in water, as above described.

DESCRIPTION OF A NEW PROCESS FOR MAKING WROUGHT IRON DIRECT FROM THE ORE; AS CARRIED ON AT THE SHIRVA WORKS, KIRKINTILLOCH, NORTH BRITAIN.*

BY MR. WILLIAM NEALE CLAY.

After describing the various stages through which, by the ordinary method, the metal passes, from the reduction of the ore to its arrival at the state of malleable iron, Mr. Clay proceeds to explain the process invented by himself, and which is in operation at the Shirva Iron Works.

By the common method, the ores are brought to the state of carburet of iron; this carburet of iron is deprived of its carbon by refining and "puddling;" it is converted into malleable iron by a number of processes, namely:—

1. Calcining the ore:
2. Smelting in a furnace, by aid of the cold or the hot blast, with coal or coke for fuel, and limestone as a flux:
3. Refining the "pig" into "plate" iron:
4. Puddling, shingling and rolling to produce the "rough," "puddled," or No. 1 bars:
5. Cutting up, piling and rolling to make "merchant," or No. 2 bars:
6. A repetition of the same process to produce "best," or No. 3 bars.

With a view to the diminution of the manipulations, by Mr. Clay's process, a mixture of dry Ulverstone or other rich iron ore (hæmatite), is ground with about $\frac{4}{10}$ of its weight of small coal, so as to enable it to pass through a screen of $\frac{1}{8}$ inch mesh. This mixture is put into a hopper, placed over a preparatory bed or oven, attached to a puddling furnace of the ordinary construction. Whilst one charge is being worked and balled, another gradually falls from the hopper, through the crown, upon the preparatory bed, and is completely and uniformly heated; the carburetted hydrogen and carbon of this coal, combining with the oxygen of the ore, assists the decomposition of the mineral, and the combustion of these gases prevents the puddling furnace from cooling. As one charge is withdrawn, another is brought forward; in about one hour and a half the iron is balled, and in a fit state for rolling and shingling.

The "cinder" produced in this operation is superior to that obtained by the ordinary method: it contains from 50 to 55 per cent. of iron, and it is quite free from phosphoric acid, which is frequently present in ordinary slags, and which is so prejudicial. When it is re-smelted, as much Nos. 1 and 2 cast-iron, and equal in quality, is obtained from it, as from the common Scotch black-band ore.

The cast iron arising from the slag,—about $\frac{1}{3}$ of that originally contained in the ore,—is mixed with the coal and ore in the puddling furnace; and thus, while almost all the iron is obtained from the ore, as much wrought iron is made, in a given time, and with the same expense of fuel, as by the ordinary plan.

The first process producing bars of superior quality, is, therefore, on an equality with the fourth stage of the ordinary method, and dispenses with the above-mentioned separate manipulations.

Owing to the absence of deleterious admixture, by once piling and reheating the rough bars, iron is produced, which is quite equal in quality, and superior in powers of tension, to that resulting from the second piling and reheating in the old way; it is contended, therefore, that the two processes produce from the hæmatite nearly one-third more iron, and of as good quality, than is generally obtained by the six processes of the ordinary system.

The iron obtained in this way bears a very high polish, is very uniform in texture, fibrous and ductile, possesses more than the average amount of tensile strength, and likewise appears more dense, since it has a peculiar sonorousness when struck, similar to that of a bar of steel. It has been formed into steel of a good quality.

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* *Abstract of a paper read before the Institution of Civil Engineers.*

IMPROVED PREPARATIONS OF TEA, COFFEE, COCOA, AND MILK.*

PATENT GRANTED TO CHARLES SEARLE.

This invention consists in preparing and solidifying milk, after the removal of the cream, by evaporation of the water; and likewise in combining tea, coffee, and cocoa, with the milk thus prepared.

After remarking that he is "aware that it has been before proposed to prepare milk together with the cream by solidifying by evaporation, and also afterwards combining the same with tea, coffee, and cocoa; but it has been found that the presence of cream renders the product obtained readily acted on, and easily injured and spoiled by climate and atmosphere, becoming rancid and offensive;" states, that by first removing the cream, the product is preserved for a much longer time.

After removing the cream from the milk, which is to be prepared, the milk is put into a vessel surrounded by water, adding to it at least $\frac{1}{40}$ of its weight of loaf sugar, in order to augment the solubility: this also aids in its preservation. The aqueous matter is evaporated by means of steam or other heat applied to the water both containing thevessel in which the milk under preparation is placed: care must be taken that the heat do not injure the milk. "The most advantageous mode," says the patentee, "of evaporating the aqueous mixture from the milk, is by means of a closed vessel, into which the milk is put, and from which the air and vapors are withdrawn, and a partial vacuum is obtained, by which the evaporation is effected at a low temperature, similar to the means now commonly resorted to in refining sugar;" milk may thus be obtained in a pure and perfectly dry state, and may be preserved in closely stoppered bottles or jars.

When the milk is to be mixed with tea, coffee, or cocoa, a strong extract of any of these three substances is to be prepared by carefully evaporating it *in vacuo*, a concentrated aqueous infusion, or by distillation, and the fluid extract obtained in this manner, is added to the milk when near solidification, a proper proportion of refined sugar being added, or not, according to desire; the evaporation is continued at a low and carefully managed temperature in a glass, porcelain, silver, or other vessel, contained in a water bath, until the whole is converted into syrup, paste, candy, or powder; or arrowroot, isinglass, Iceland-moss, or the like, may be added, which renders it nutritive, and it may be converted into lozenges, adding these substances, or some essence or spice to impart flavor according to desire.

ON THE MANUFACTURE OF LUCIFERS.

BY M. JOBLONOUSKI.

Forty grammes of phosphorus are put into a phial with a large opening, and sufficient spirit of turpentine to completely cover the phosphorus is added; ten grains of flowers of sulphur are added to the mixture, and the phial is put into hot water, with great caution, until the phosphorus is completely melted. The mouth of the phial is then closed with a cork, and the whole is strongly agitated until cold. In this state, the supernatant spirit of turpentine is gently poured off.

Into the thick pappy mass of phosphorus which remains in the phial the extremities of the lucifers are steeped, and, after some time, when they have become rather dry, they are dipped into a mixture prepared in the following manner:—

Thirty grammes of gum-arabic are dissolved in a little water; twenty grammes of chlorate of potassa are added to it, and the whole is mixed until the mass is homogeneous. In this state, 10 grains of soot, bruised with a little spirit of wine, are added. In twelve hours the lucifers are entirely dried, and, by rubbing them on a rough substance, they inflame without fulmination.

The process is very simple; and for a few centimes thousands of lucifers of the first quality may be obtained.

Although this process is very simple, we do not recommend our readers to employ it. The combination of sulphur and phosphorus detonates with great facility, and the accidents which it has produced in Paris have led to its employment in the manufacture of lucifers being proscribed.

The following is a formula for making lucifers, which succeeds very well:—

Chlorate of potassa	2
Phosphorus	4
Gum arabic	7
Gelatine	2

The phosphorus is divided in the gum brought to the state of thick mucilage, and warmed: the gelatin is melted and added to the phosphoretted mucilage.

The chlorate of potassa is bruised in a mortar, and at the same time moistened with the mucilage. When it is bruised the whole is mixed together, and a paste is obtained with which lucifers tipped with sulphur may be endued. The lucifers are then dried in the air ! ! !

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* Rewritten from *The Repertory of Patent Inventions*, No. 4, 1843.

THE PATENT ELASTIC PAVEMENT COMPANY.

At the invitation of this company, we inspected their works at the Square Shot Tower, Waterloo-bridge, on the 4th ult., and it gives us great pleasure to be able to testify to the excellence of the arrangements and the completeness of the process. Having, in our last number, given our opinion of the pavement, we have nothing to add on that head, but feel it incumbent on us to again call the attention of our readers to it.

ANALYSIS OF THE VITRIOLIC ASHES OF FORGES-LES-EAUX.

(*Seine-Inferieure.*)*

BY MM. GIRARDIN AND BIDARD.

In the environs of Forges-les-Eaux, there exist, on or near the surface of the soil, more or less thick layers of black aluminous and pyritous lignite, which has long been worked for the manufacture of copperas. This copperas, known in commerce under the name of *Copperas of Forges*, is one of the purest and best we know.

The pyritous earths, after having been washed, are ordinarily mixed with one fourth of their weight of turf ashes, employed in the greater part of the country of Bray as a very powerful stimulant manure for meadows, humid herbages, and arable lands properly so called.

M. Dupré, proprietor of the exploitation of pyritous earths, sells the washed earths under the improper name of vitriolic ashes, at the rate of 1 franc per hectolitre. They are perfectly analogous to the black ashes or earths of Picardy, which have the same origin and the same employment.

MM. Girardin and Bidard analysed a sample sent to them by M. Dupré. The following are the results of their examination:—

100 parts of washed ashes contain 24 of water.

100 parts of this manure dried contain :—

Matters soluble in water	4·53	Organic matter or soluble humus	2·74
		Sulphate of protoxide of iron Sulphate of peroxide of iron	1·79
Matters insoluble in water	95·47	Fine sand	38·92
		Insoluble humus	49·83
		Sulphuret of iron Peroxide of iron	6·72
	100·00		100·00

MM. Girardin and Bidard have determined with care the quantity of nitrogen, by means of Liebig's apparatus. They obtained 2·72 per cent. of nitrogen by weight.

The strength of this manure is, then, expressed by the cypher 680·0, and its equivalent by that of 14·70, whence it results that 14 kilogr., 70 of vitriolic ashes of Forges, have as much action with respect to its nitrogen, as 100 kilogr. of normal dung.

Picardy ashes contain, according to MM. Boussingault and Payen, only 0·65 per cent. of nitrogen, and their equivalent is represented by 61·50.† The vitriolic ashes of Forges are, therefore, far superior in this respect.

The existence of sulphate of iron in these earths, which is continually reproduced by the action of the air on the sulphuret of iron which exists in it in very fine particles, explains the very active properties which they possess, as a stimulant, on natural and artificial meadows.

Their powerful efficacy may be referred to several causes :—

1. To their dark color, which has great influence on the heating of the earth by the solar rays :

2. To the sulphuret of iron, which, by its slow combustion, increases the heating of the earth and the electrical excitation :

3. To the large proportion of soluble and insoluble humus :

4. To the sulphate of iron, which, besides its property of causing bad herbs, mosses, lichens, &c., to perish, reacts on the carbonate of lime of the soil, and forms sulphate of lime which acts so powerfully on leguminous plants.

From their composition, it is evident, that it is especially on calcareous soils, and on soils frequently limed and marled, that the vitriolic ashes produce the best effects. This has also been demonstrated by experiment.

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* *Travaux de la Societé d'Agriculture de Rouen*, July, 1842.

† See our present Number, page 409.

ON MANURES AND THEIR COMPARATIVE VALUES.

BY MM. BOUSSINGAULT AND PAYEN.

Synoptical Table of the Equivalents of Various Manures.

Substances.	Equivalent of the Dry Substance.	Equivalent of the Substance in the Normal State.	Observations.
Farm-yard dung	100	100	
Pea straw	100	22·3	
Millet straw	203	51·28	
Buckwheat straw	361·1	83·83	
Lentil straw	174	39·6	
Wheat straw	650	166·66	
Idem	367	81·6	Old, environs of Paris.
Idem lower part	453·4	97·5	0·67 of the length.
Idem upper part	137·3	30·0	0·33 of the length.
Rye straw	975	235·2	
Idem	390	95	1841, environs of Paris.
Oat straw	541·66	142·85	
Barley straw	750	173·9	
Husks of wheat	207·4	47	
Dried stalks of the artichoke	453·48	108·1	
Leaves of madia	295·45	70·1	
Broom	142·3	32·78	
Leaves of beet-root	43·3	80	
Leaves of potato	84·78	72·72	
Leaves of carrot	66·3	47	
Leaves of heath	102·6	22·9	
Fucus digitatus	138·8	46·5	
Idem.	123·4	42·1	
Idem saccharinus	85	28·9	
Idem	,,	74	On leaving the sea.
Grains	39·7	8·8	
Buried roots of clover	110·16	24·28	
Cake of linseed	32·5	7·69	
,, of colza	35·45	8·13	
,, of arachis hypogea	21·19	4·62	
,, of madia sativa	34·2	7·9	
,, of refinement	332·0	74·97	Of fish oil by the sawdust of the poplar.
,, of refinement	49·7	11·3	Of green fats by the sawdust of the poplar.
Seeds of white lupin	44·8	11·4	
Grape grounds	58·9	53·39	
Idem	54·7	21·85	
Pulp of beet-root	154·7	35	Dried in the air.
Idem	,,	105·8	On leaving the press.
Pulp of potatoes	100	76	
Juice of potatoes	23·30	136·38	
Water from starch manufactories	,,	571·42	Washings with 4 vols. of water.
Idem	,,	045·7	Washings with 5 vols. of water.
Deposit from the waters of starch manufactories	107·7	111·1	Drained in heaps.
Idem	,,	24·5	Dried in the air.

Substances.	Equivalent of the Dry Substance.	Equivalent of the Substance in the Normal State.	Observations.
Water from dunghills	126·26	67·7	Washings by the rains of a year.
Sawdust of acacia wood	513·1	137·9	Dried in the air.
Idem	629·3	173	*Idem.*
Sawdust of fir	886·3	250	*Idem.*
Idem	629·3	173·9	*Idem.*
Sawdust of oak	256	74	*Idem.*
Solid excrements of the cow	84	125	
Urine of the cow	51·3	90·9	
Mixed excrements of the cow	75·2	97·5	Calculated result.
Solid excrements of the horse	88·2	72·7	The horse drank little: urine thick.
Urine of the horse	15·5	15·3	
Mixed excrements of the horse	64·05	54	
Mixed excrements of pigs	57·86	63·4	
„ of sheep	65·2	36	
„ of goats	49·6	18·5	
Pigeons' dung	21·6	4·8	
Liquid Flemish manure	„ „	210·5 181·8	
Idem	44·3	10·3	Dried in the air.
Poudrette of Belloni	73	25·6	As sent out to agriculturists.
Idem of Montfaucon			
Oyster shells	487·5	125	
Goëmon, called *burnt*	487·5	105·26	
Soot from coals	122	29·62	
Soot from wood	148·85	34·78	
Mud of the river Morlaix	464·28	100	
Sand of the Bay of Roscoff	1392·85	307·69	
Marl	377·17	78·1	
Picardy ashes	274·6	61·5	
Dry muscular flesh	13·6	3·06	
Salt fish	17·95	5·97	
Idem washed and pressed	10·40	2·37	
Dry blood (soluble)	12·64	3·28	
Liquid blood	„	13·3	
Idem	„	14·74	
Blood, coagulated and pressed	11·47	8·86	
Insoluble dry blood	11·47	2·69	
Feathers	11	2·60	
Hair of oxen	12·89	2·9	
Woollen rags	9·62	2·22	
Raspings of horn	12·35	2·78	
Cockchafers	14·14	12·7	
Burnt bones	25·72	5·70	
Humid bones	„	7·54	
Greasy bones	„	6·43	
Residue of glue	213·8	75·75	
Grounds of size	34·6	10·8	
Cake of greaves	15·07	3·36	
Animal black of the refineries	95·5	37·7	The real effect of these three last is five times that indicated by the strength of the equivalent.
Animalised black	98	36·61	
Black of the fields	65·9	32·29	

⁂ *The Second Memoir of MM. Boussingault and Payen will be given in our next.*

ON GUANO OR HUANO.*

BY MM. J. GIRARDIN AND BIDARD.

Until within the last few years, we never thought of employing guano as a manure. Some English vessels, coming from the coasts of Peru, having brought over large quantities of it as ballast many experiments have been made in England, and the results have greatly exceeded the hopes of agriculturists, who bear witness to the superiority of this manure. 200 kilogrammes of guano and 25 or 30 kilogrammes of charcoal are sufficient for manuring an *hectare* of corn land.

The sample operated on by MM. Girardin and Bidard, at the invitation of the *Société d'Agriculture de Rouen*, was a coarse brown powder, exhaling a strong and fetid odor. Two quite distinct parts could be mechanically separated from it :—

1. A humid brown dust, containing a large quantity of carbonate of ammonia :

2. Small, whitish, semi-hard grits, which differed from the above dust only by the total absence of carbonate of ammonia.

These small grits were analysed, and the following are the substances which they contained :—

Urate of ammonia
Oxalate of ammonia
Oxalate of potassa
Oxalate of lime
Phosphate of ammonia
Phosphate of potassa
Phosphate of lime
Phosphate of magnesia
Sulphate of potassa
Chloride of potassium } very little.
Fatty matter

This analysis sensibly differs from that of Fourcroy and Vanguelin, made in 1804,† and from the more recent one of Wöhler.‡ At all events, this composition of guano almost identical with that of aquatic birds and poultry, throws great light on the origin of this matter. It is evidently the excrement of birds : but as, according to the observations of Baron Humbolt, the *Ardea* and *Phenicoptera*, which inhabit the islands of the South Seas, could not produce such immense masses of guano as those which exist in these isles. MM. Girardin and Bidard state this new opinion ; that guano does not belong to the present period, and that it is a *coprolite*, or fossil excrement of ante-diluvian birds.

The presence of carbonate of ammonia in the fine dust separated, by sifting from the grits, is purely accidental. It is probable that it is the product of the decomposition of urate of ammonia, which is easily effected under the influence of atmospheric humidity. This opinion is corroborated by the fact of the grit, when exposed to the contact of the air, speedily dilating and falling to dust, which then contains much carbonate of ammonia, which may be isolated and sublimed by means of a gentle heat.

Of all the principles which constitute guano, the most important one, without doubt, is uric acid and ammonia. It is to their presence, and especially to their abundance, that the very great fertilising properties of this plant must be attributed. If, as cannot be doubted, the value of manures depends greatly on the proportion of nitrogen that they contain, and if the rapidity of their action on vegetation, is in direct ratio to the facility with which they yield to plants their soluble or gasifiable nitrogenous principles, it is easy to comprehend the superiority of guano over most other manures, and the promptitude with which it operates. It is absolutely in the same condition as *columbine* or pigeons' dung, whose chemical nature is identical, except that the latter contains a smaller proportion of ammoniacal compounds.

In order to determine the value of guano as a manure, MM. Girardin and Bidard estimated the uric acid and ammonia found in it. Their analysis showed that 100 parts of guano by weight contained :—

18·4 of dry uric acid, which represents . .	6·13 of nitrogen
13·0 of ammonia which represents . . .	10·73 ,,
Whence it follows that 100 of guano represent .	16·86 ,,

The proportions of uric acid and ammonia vary according to the degree of alteration which it has undergone, an alteration the effect of which, as we have already said, is the conversion of a portion of urate of ammonia into corbonate of ammonia, whose volatility facilitates continual waste. It is only in this manner that we can explain the considerable difficulties which exist, with respect to the proportion of nitrogen, between the results of MM. Boussingault and Payen, and those of MM. Girardin and Bidard. The former found, indeed, only 4·97 per cent. of nitrogen in normal or crude guano; and 5·39 per cent. of nitrogen in guano sifted, and separated from dust.*

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* *Travaux de la Société Central d'Agriculture de Rouen.*

† *Annales de Chimie et de Physique*, tome lv., p. 289.

‡ Annual Report on the progress of Chemistry, 1842. By the Baron Berzelius, page 124, of the French Translation.

Again, while MM. Boussingault and Payen give for the equivalent of sifted guano the cypher 7·41, according to MM. Girardin and Bidard the equivalent of the same substance would be 2·37.

[The proportion of nitrogenous matter contained in guano, by which alone its value as a manure is estimated, is so very variable as to render it exceedingly injudicious for agriculturists to purchase it without first having it analysed. It should be paid for only according to its *useful contents.* Not only do the analyses of Fourcroy and Vauquelin, Boussingault and Payen, Girardin and Bidard, and Wöhler, vary considerably, but those of Mr. Johnston, and the late Mr. Henryell show very different proportions of nitrogenous matters. From very numerous analyses of guano which we have ourselves performed, we are enabled to assert that no two samples are of the same value. We advise our agricultural readers not only to have the guano analysed by a chemist practically acquainted with the analysis of this complex substance, but also to pay for it only according to its *real value* as a manure.—EDS.]

ON THE FORMATION OF FAT IN ANIMALS.*

BY PROFESSOR LIEBIG.

AT the sitting of March 6, M. Dumas expressed himself with respect to the opinion which I have formed on the origin of fat in herbivorous animals, in the following terms. (See THE CHEMIST No. XLIII., N. S. No. VII. p. 318.):—

"As soon as he was acquainted with our analyses of provenders, Professor Liebig hastened to repeat them, and in this case, as in that of maize, he has ascertained their accuracy; he was therefore mistaken in denying the existence of fatty matters in the aliments of herbivora. But he now states other objections to the opinions which he combats. It is no longer a question of the total absence of fatty matters in those aliments, but the proportions and properties of these matters."

I may be allowed to remark to the Academy, that the analyses of MM. Dumas and Payen which have come to my knowledge, are reduced to a determination of the matters soluble in ether which hay and maize contain. I am ignorant of the other analyses of these gentlemen, which have led them to admit that the grass and roots eaten by cows contain butter, and that the food given to cattle, contains beef fat. I have denied and I again deny the presence of fats (combinations of fatty acids with glycerine) in the nourishment of the cow and of the ox; I deny the presence of bile (or rather of the matters soluble in ether, contained in bile) in the same nourishment; I deny the presence of fish oil and of spermaceti in sea plants; but I voluntarily admit, with fifty other chemists, that grass and green leaves contain green wax, commonly called chlorophylle, and my own investigations have put me in a position to confirm the discovery of the excellent observer Proust, that provender, the green leaves of cabbages, of the Graminaecæ, cherries, and prunes, contain a white wax.

I am, indeed, astonished that the presence of this wax in hay and potatoes should have escaped the observation of such experienced chemists, for they have made no mention of it in the two memoirs which they have read before the Academy; and it was only after I had called their attention to this wax by sending my memoir, from which M. Payen quoted at the sitting of the 6th of March, an incorrect passage, that they hastened to modify their new theory. I am, in fact, inclined to believe that M. Dumas, in giving his opinion concerning the origin of fat in animals, had not made any experiment on the subject, for he informed the Academy at the same sitting, that he, M. Boussingault, and M. Payen, had simply adopted the plan of Gmelin and Tiedemann, who suppose the fatty matters to be ready formed in the aliments. The avowal of these gentlemen, that this theory belongs not to them, but to my illustrious countrymen, appears to me somewhat late; but it is true that they have now to partake a certain responsibility.

In the experiment which I have related in my letter, (see THE CHEMIST, No, XLIII., N. S. No. VII. p. 315), a cow which ate, on the estate of M. Koch, at Giessen (15 kilogr. of potatoes and 7 kil. 500 of hay) received in its food in six days, according to my analyses, 756 grammes of matters soluble in ether, and in its excrements the same cow rendered in six days 740 grammes of matters soluble in ether, that is to say, very nearly all that had been consumed. The cow in question furnished to M. Koch, in six days, a quantity of milk, equal to that which M. Boussingault obtained, in his land at Bechelbronn, from a cow submitted to the same regimen.

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* *Annales de Chimie*, 3e *Serie*, *annèe*, 1841, t. iii. p. 105. [There must be some mistake in this reference: there is nothing about guano on the page in question, from which we have translated the synoptical of this equivalent of various manures. (See page 408 of the present number.—EDS.]

It is impossible to draw from my experiments any other conclusion than the following:—*The fatty matters contained in potatoes and hay contribute nothing to the formation of butter, since they pass out in the fœces.*

In my memoir, which I have sent to MM. Boussingault, Payen and Dumas, I say that the substance which is extracted from hay by ether, consists of chlorophylle and a peculiar wax, different in its properties from bees' wax: it has the greatest resemblance to the waxy matter so abundantly collected from the leaves of the sugar cane, by M. Avequin, a matter to which M. Dumas gave the name of *cerosie*, and which was analysed by the same chemist.

This wax I have found in the fœces of the cow, in the same state and with the same properties it possessed in hay.

My experiments are not, therefore, fictitious,—as M. Dumas would make the Academy believe,—but real. They prove that the waxy matters contained in the leaves of plants, in passing into the body of herbivorous animals, are not forced to undergo in their blood the influence of oxygen, and do not experience the commencement of oxidation from which steäric, margaric and oleïc acids result.

In my work on *Chemistry, applied to Physiology and Pathology*, I have described, in detail, the experiments of M. Gundlach, at Cassel (not those of Huber, as M. Payen is pleased to believe), which show that for 20 parts of honey consumed by bees, they furnish 1 part of wax. Gundlach again shows that wax is also produced when bees are fed with cane sugar, a result which is not astonishing, since it is known that honey contains grape sugar.

MM. Dumas, Boussingault and Payen, explain the formation of wax in the body of bees fed with honey, in a very ingenious manner; these skilful chemists are inclined to believe (see THE CHEMIST, No. XLI., N.S. No. V. p. 214), "That it is with a bee as with a nurse. If the latter finds in her aliments the fatty matter and proteïn which her milk requires, she produces milk for the child, and her health does not suffer from it. If, on the contrary, she be entirely or partially deprived of these fatty or albuminoid aliments, she certainly still produces milk, but it is at the expense of her own substance that milk is produced in such a case."

In cows fat is produced, therefore, according to MM. Dumas, Boussingault, and Payen, from the wax contained in hay.

In bees nourished with sugar, it is from their fat that wax is formed.

From the foregoing, it will be very curious to examine whether sugar of milk is wanting in the milk of a nurse whose milk is produced at the expense of her own substance, or whether it is produced at the expense of the fat or of the albuminous matters. It is a physiological fact of the highest importance, that, according to my analyses, herbs and seeds, of the environs of Giessen, which produce in the body of cows the same effects as at Paris, differ so much, with respect to the fatty matters which they contain, from those of the environs of Paris. The fibrin also at Paris presents another composition than at Giessen; and the most curious discovery is, doubtless, that the legumin extracted from peas, lentils, and beans, in Paris, dissolves in acetic acid and contains 18 per cent. of nitrogen, whilst the same matter, prepared according to the same method at Giessen, is insoluble in that acid and contains only 14 per cent. of nitrogen. (See *Comptes Rendus*, vol. 16, p. 976.)

M. DUMAS remarked that at the point at which this discussion had arrived, it was necessary to lay aside reasonings and to resort to facts; it evidently appertained to the department of practical agriculture, to which it belonged definitively to solve it by well-combined experiments, and which may find a source of considerable profit in the application of the views, whichever they may be, whose justice will remain demonstrated.

He, however, requested permission of the Academy to add a few words to the letter of Professor Liebig, to clear up the difficulties which it raised *de novo*, as well as to supply the absence of M. Payen, whose health had forced him to quit the sitting.

1st. Professor Liebig has said, and repeats, that between wax and common fatty matters there is a profound line of demarcation, since wax is insoluble in the alkalis, and is not susceptible of being converted into fatty acids similar to those which ordinary fatty bodies contain. It would be easy to prove that we have here long known the contrary concerning this point, which does not seem to have been the subject of personal experiments on the part of Professor Liebig.

I have been commissioned this very day to present to the Academy the results of a work on this subject which has been studied with the greatest care in my laboratory, by M. Lewy, of Copenhagen; and this coincidence is so singular, that I must add that it was at the same time that M. Floureus (one of the perpetual secretaries of the Academy of Sciences,) communicated to me Professor Liebig's letter, and that M. Lewy announced last year that he was occupied with these investigations.

M. Lewy has ascertained, as will be seen in the detailed memoir which I present in his name (See The Chemist, No. XLIII, N.S. No. VII, p. 301), that wax is really soluble in potassa, and that it is converted, by the action of this alkali employed at rather a high temperature, into steäric acid, or at least into an acid fusible at 158° F., and endowed with the exact composition of steäric acid. Every one knows how easy it is to change steäric into margaric acid. Thus, the two principal acids discovered by M. Chevreul, in the most common fatty bodies, may be derived from wax by simple oxidising influences, as we have admitted.

Without affirming that the wax of provenders contributes, rather than the fatty matters which they contain, to the fattening of cattle fed with them, it may be said, with regard to wax, the objection of Professor Liebig is unfounded. The question remains entire, and we persist in thinking that the direct experiments by which we have endeavoured to solve it, were not useless, and we shall continue them. Moreover, Professor Liebig will regret all the insinuations which his letter contains, when I prove, that, ever since the spring of 1842, I have publicly expressed the opinion concerning the part performed by the waxy matters, which I declared before the Academy on the 6th March, of the present year, always rendering to Tiedemann and Gmelin, the part which is due to them in this theory.

2. Without denying the possibility of the formation of fatty bodies by certain fermentations of sugars, we repeat that nothing proves it, and we regard as more simple and more probable, the entirely vegetable origin of the fats of animals. If we have adopted this opinion, it is not because we were ignorant of Huber's experiments on the formation of bees' wax. These experiments, which were made sixty years ago, are very numerous, and would be very decisive, if account had been taken of the losses sustained by the bees. Huber fed his bees with sugar as well as with honey; he fixed at $\frac{1}{20}$ the weight of wax furnished by these aliments. Thus, he has, in all respects, an indisputable priority over M. Gundlach, to whom M. Liebig persists in attributing the merit of these observations, and whose work is, at the most, but two or three years' old.

Such is, doubtless, the motive which induced M. Payen to quote Huber, and not Gundlach; and nobody will admit, that, by repeating in 1840 experiments already made in 1780, the first discoverer can be deprived of his merit.

3. M. Liebig cursorily touches, in his letter, on a question on which I request the Academy's permission to dwell for a moment.

I admitted, in my course of lectures last year, at the School of Medicine, of unpublished experiments which had been communicated to me, and of which I shall give the detail at the next sitting, that sugar of milk may be produced by a special fermentation of ordinary sugar. I had very naturally concluded from this, that such is its origin in the milk of herbivorous animals, and that the milk of carnivorous animals should be free from sugar of milk. Now, as until then no analysis of the milk of carnivora had been made, I thought that I ought to devote myself to it; but the attempts which I have made to procure it, have hitherto proved unavailing, because I wished to operate on sows, which, as regards regimen, are well adapted to the experiment, but from which it was impossible for me to draw milk, as I stated before the Academy, in reading the memoir *On the Neutral Nitrogenous matters of Organisation*, common to myself and M. Cahours. (For this important memoir, see The Chemist, Nos. XXXVII. and XXXVIII., N.S., Nos. I. and II., pp. 10 and 49.) Sows cannot be milked; and, in endeavoring to draw the milk by means of *cupping glasses*,* blood is extracted sooner than milk.

But, I hope, that the very interesting question which I raised, and which Professor Liebig here reproduces, will soon be solved, M. Delafond, Professor at the School at Alfort, having been kind enough to promise me the means of accomplishing the experiment which I had in view, namely, the analysis of the milk of an animal fed sometimes with meat, and sometimes with vegetable aliments.

4. Finally, I come to the essential object of Professor Liebig's letter, *which assures us he has made a real experiment on the production of milk*, whilst it appeared to M. Boussingault and myself, that his letter of the 6th of March was a simple reproduction of an article, in which it was manifest that he had contented himself with combining two distinct experiments of M. Boussingault himself, with some determinations executed at Giessen, on the quantity of fat contained in provenders and dung. I confine myself to observing, in the face of this affirmation, that, if Professor Liebig's experiment be

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* *Comptes Rendus*, No. 14.

real, it is in full contradiction of that which has served for controlling our views.

[M. Boussingault *made some observations, which, as well as some further remarks by M. Dumas, want of space compels us to defer until our next.*]

CULTURE OF POTATOES SO AS TO HAVE NEW POTATOES IN MARCH.

According to the Saxon Journals, the agriculturists of that country plant their potatoes in August; they flower in October. It is sufficient, on the approach of frost, to cover the whole plant with litter, in order to secure them against the great cold. In February, tubercles may be detached, which, without being perfectly ripe, will be distinguished by their size and freshness. In March, the state of maturity is completely attained by the whole plantation.

MEANS OF PREVENTING POTATOES FROM GERMINATING.

It is sufficient to place them for a quarter of an hour in a slightly heated oven; but care must be taken that they be not too dry when put in it, in order that the skin may not tear. After this operation, the potatoes may be preserved for more than a year.

IV. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ON MEDICINAL EXTRACTS.

BY G. M. MOWBRAY.

The manufacture of medicinal extracts may be considered with advantage under two divisions—the one involving the production of a fluid containing the active ingredients of the matters operated on, and the other, the reduction of such fluid to a less compass, whether as an inspissated juice, resinous extract, mellago or essential salt.

1. As to procuring the active ingredients in the fluid state. Under this division a few observations referring to a class of medicines of comparatively recent introduction, viz.—*liquors*, concentrated infusions, may be appropriately introduced. The chief difference between these and the normal solution intended to be reduced to an extract consists in these liquors, &c., containing less gum, albumen, and starchy matters, with a certain portion of spirit to prevent decomposition, whilst in the normal solution intended to be reduced to an extract, these inert matters serve to swell the product, and further, the spirit is unnecessary. The introduction of these preparations (liquors) if fairly investigated, will be found to have arisen from the very inferior extracts which have been produced in order to meet competition in price, since, had this class of medicines (extracts) realised the expectations that were anticipated from them, viz. "*a concentrated solid mass exactly representing in medicinal efficacy the materials from which it has been prepared, and capable of being re-dissolved, so as to form a solution exactly similar to that whence it has been derived,*" we should never have been introduced to the liquors and similar preparations.

Should the above be an accurate definition of the term extract, as I conceive it is, what pretensions the rubbish sold may possess to that title, I leave the manufacturers to prove; but we cannot be surprised that when a class of medicines sinks beneath a certain level, another will take its place.

Subjoined is a formula, whereby one of these preparations may be procured, and which is introduced here as affording a skeleton receipt for remedies of this class: the pharmaceutical chemist will readily introduce such modifications as will render it applicable to each of these preparations.

* Take of dried dandelion roots, perfectly clean and sliced, 18 ounces; macerate 24 hours in a sufficient quantity of cold water to cover them; press, and set aside, that the fecula may subside; decant, and heat the clear liquor to 180° F., so as to coagulate the albumen; filter the liquid while hot, and evaporate in a drying-room until the product weighs only 14 ounces. To this must be added 4 ounces of rectified spirit, sp. gr. ·835.

It has been stated by some writer, and repeated by the numerous compilers who favor us with their sometimes useful labors, that during the process of drying plants, herbs, or roots, the albumen is coagulated, and thereby rendered insoluble; but those who may have occasion to practise the above formula, will find it necessary to negative his assertion.

There are several species of charlatanism, and the most offensive perhaps is that which presents itself under the assumed mask of scientific liberality. I am led to these remarks in consequence of the conduct of those who once had an excuse for withholding the formula for a nostrum (as Dr. Paris very properly stigmatises a secret preparation), in the absence of any recognised journal wherein such formula might be inserted; I repeat that I am led to consider as the most offensive species of charlatanism of modern times, that which refers to a laboratory journal for a formula which has never been inserted therein, and causes to be inserted in the public journals of the day formulæ which, if carefully and strictly followed, never can produce the preparations such descriptions profess to refer to. One example of this quackery is the notorious Liquor Opii Sedativus; two others I now submit in the form of one vessel wherein crystals of cinchonine will be found to have deposited, out of all proportion to the quantity of cinchona bark the liquid professes to represent; and another vessel which is labelled Liquor Taraxaci, and which professes to be the juice of the dandelion coagulated by heat, and thus the albumen removed, whereas the slightest examination at once points it out as a mere solution of an inferior extract, the peculiar empyreumatic flavor being clearly distinguishable.

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* First inserted in the *Annals of Chymistry*, p. 113.

Where dried vegetable matters have to be submitted to maceration, I prefer that it should take place *in vacuo;* this enables the operator to leave the ingredients exposed to the action of the menstruum (water) for twelve months if preferred, or if occasion should render it convenient, without the slightest fear of decomposition. I have infused henbane leaves dry, and powdered, in water *in vacuo* for twelve months, and the narcotic perfume of the plant was as intense as on the first day.

The instrument I now submit to the members of this society has been used for purposes referred to. It is not exactly a model of the arrangement on the large scale, although founded on the same principles, and therefore adapted for their exemplification. (The apparatus referred to consisted of what is known as the hydraulic filter, with a silk air valve at the upper surface of the cylinder, so as to enable the operator to exhaust the cylinder by means of a syringe, whilst a stopcock closes the communication with the piston and cylinder of the force pump; thus exhausted of air the ingredients are macerated *in vacuo* for any length of time until it suits the convenience of the operator to strain the saturated solution from its dregs.)

I have been led to prefer, and believe my suggestion to be as novel as it is original. maceration *in vacuo* with cold water or hot according as the ingredients may be albuminous or resinous, thereby effecting the solution of the active principles or soluble constituents by prolonged action, without a chance of decomposition; and if the solution thus procured be intended for a concentrated liquor, the removal of the albumen is to be effected by heating in the usual manner and the precipitation of the gum by the addition of spirit sufficient to prevent decomposition of the soluble organic constituents; that the gum and albumen should be removed also even when the solution is intended to be reduced to an extract, would be most desirable; but at present it is not insisted upon by the college, and few manufacturers possess the magnanimity or inclination requisite for practising it.

Liebig in his Organic Chemistry (French edition) describes the mould or decomposition of organic matter in aqueous solutions, as occurring from the combination of the oxygen of the atmosphere with the nitrogenous constituents of the vegetable; and Gay Lussac proved in an experiment with the juice of the grape, that by removing the atmosphere, the element which causes fermentation is absent, and it is merely the practical application of these principles that I have found so advantageous in the preparation of the remedial agents under consideration.

In the preceding remarks the procuring a solution of the active ingredients from the dry vegetable has been considered; the production of a similar fluid from the fresh plant is so simple, that, excepting a few suggestions, I shall now proceed to consider the means which have been recommended for effecting the reduction of such solution to the consistence of an extract.

These suggestions are, that, after the herb has been bruised in a mortar, offered to a revolving rasp, or submitted to the action of the mill, under the arrangement of a stone revolving on its edge, and subsequently pressed, the *marc* or residue should be examined by maceration in cold water, with a view to ascertain if the soluble constituents of the plant have been really exhausted, for although, by the present popular methods of evaporation, it is desirable that the juice should be as concentrated as possible, on account of the injury the liquid sustains during the process of evaporation, yet as I think I can show further on a method of conducting the process which will not modify the constituents of the evaporating ingredients, and to which therefore as this objection does not apply, we may return to an endeavor to totally exhaust the plant acted upon.

NEW INVESTIGATIONS CONCERNING THE VALERIANATES OF QUININE, ZINC, &c.*

BY PRINCE LOUIS LUCIEN BONAPARTE.

When an alcoholic solution of quinine is saturated with valerianic acid, twice its volume of distilled water being added to the liquid, and the whole being submitted to evaporation by a gentle heat, crystals of valerianate of quinine are obtained. These crystals are consistent and unalterable in the air, and differ so much in form and appearance from the other compounds of this base, that it is impossible for an experienced chemist not to recognise this salt at once, when properly prepared. In turning this preparation to commercial account, importance must be attached to the consistence of the crystals, and especially to their hexhahedral and octohedral forms, which may be ascertained by means of a powerful microscope. Although the silky aspect observed in all the other salts of quinine, proves neither the impurity nor the adulteration of the valerianate of this base, which may be presented under this form of crystallisation, it should, however, inspire the chemist with distrust, and he should assure himself of it by means of heat, sulphuric acid, water, alcohol, &c.

I consider the following details concerning the properties of this salt necessary, in order that chemists may easily recognise that which is frequently met with in commerce, and which is sometimes impure and even adulterated, as I have been enabled to ascertain.

Crystallised valerianate of quinine, of whatever crystalline form, submitted to a heat of about 194° F., fuses into a transparent liquid, which, by cooling, assumes the form of a vitreous mass, greatly resembling gum arabic: 100 grains of crystallised valerianate of quinine lose, by simple fusion, about $3\frac{1}{3}$ grains of water, that is to say, one equivalent; another equivalent cannot be separated in any way, as may easily be ascertained by insensibly augmenting the degree of heat, which causes vapors of almost pure monohydrated valerianic acid to be developed from the mass in fusion. It may, therefore, be admitted that the crystallised valerianate of quinine is formed of 1 equivalent of valerianic acid, 1 equivalent of quinine, and 2 equivalents of water, one of which constitutes water of crystallisation.

The vitreous mass of valerianate of quinine readily dissolves in alcohol; if it be concentrated, we obtain by evaporation only an amorphous mass, which does not present any appearance of crystallisation; but if about an equal bulk of water be added to the alcoholic solution of the vitreous mass, and if the whole be submitted to evaporation by means of a very moderate heat, crystallised valerianate of quinine containing 2 equivalents of water is obtained. I shall call the latter *bihydrated valerianate of quinine*, giving the epithet of *hydrated* to the fused valerianate, with 1 equivalent.

In order to obtain from the fused valerianate dissolved in alcohol, crystals of bihydrated valerianate, the fusion must not be too long maintained, and the heat must not exceed 194° F.; beyond this limit, as I have already said, vapors of valerianic acid are developed, and the vitreous mass presents an excess of free quinine, which water precipitates from its alcoholic solution.

The oleaginous drops which are deposited in a boiling solution of valerianate of quinine, are only fused valerianate.* The salt resulting from the fusion of the crystals has a composition identical with that of the oleaginous drops. The alcoholic solution, as well as that of the vitreous mass, diluted with water and submitted to spontaneous evaporation, furnishes, even without a fresh quantity of valerianic acid, the salt in a crystallised state. However, it is necessary for the dessiccation of the vitreous mass and of the oleaginous drops, that they be not submitted to to powerful a heat, nor for too long a time; in this case the addition of a little valerianic acid is requisite in order to saturate the liberated quinine which would be precipitated by means of water.

The oleaginous drops, instead of being a subvalerianate, are, then, only partially dishydrated and fused valerianate of quinine.

This same valerianate may be formed by adding monohydrated valerianic acid to a concentrated aqueous solution of valerianate of quinine. I at first thought that the oleaginous drops which are formed in this case, and which ultimately occupy the bottom of the vessel, were an acid valerianate, but their composition does not justify this opinion. They are composed only of hydrated valerianate of quinine, and their formation is explained by the affinity of monohydrated valerianic acid for the water, which is necessary for the existence of the bihydrated valerianate. The hydrated valerianate which is formed under these circumstances, being very sparingly soluble, is precipitated under its ordinary aspect of oleaginous drops.

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* *Journal de Chimie Medicale,* June, 1843.

* Before analysing these drops, I thought that they might constitute an isomeric body, a valerianate of quinine; but on again examining them, I was convinced that they were nothing more than fused hydrated valerianate, very sparingly soluble in water. The conversion of bihydrated valerianate, by means of heat, into hydrated valerianate, is a phenomenon analogous to the conversion of trihydrated valerianic acid into monohydrated valerianic acid and water, in the distillation of the former of these acids. The picrates or carbazotates of quinine and cinchonine described by me, and the nitrates of this base, all present the same phenomenon, except that the valerianate and picrate in oleaginous drops, covered with a slight layer of water, are not converted, like the nitrate, into a crystallised salt, after several days' contact with that liquid.

If an alcoholic solution of quinine be added to an alcoholic solution of valerianate of quinine, the liquid becomes very turbid by the addition of water, which must be attributed to the quinine having become free; the filtered solution contains an excess of quinine; it restores the blue color of litmus paper, previously reddened by a weak acid; it cannot be crystallised, or, at least, crystallisation is effected with difficulty, and the crystals which result, observed with the microscope, so greatly resemble those of the valerianate, that it is probable that they are identical with the latter, and that the excess of quinine is separated by crystallisation; this is so much the more probable, as the crystals are presented to the naked eye with a pulverulent aspect; observed with the microscope they never appear exactly isolated, but as mixed with another amorphous substance, which, in this case, is the uncombined quinine. If, then, there exists a subvalerianate of quinine, its existence is based on very feeble affinities.

The crystalline form of valerianate of quinine is that of an octohedron, some of whose faces are larger in proportion than the others. When it is pure, it always crystallises under this form, by submitting to evaporation at a gentle heat, a concentrated aqueous solution of this salt. In other circumstances, it often takes this form, or else that of a hexahedron, which can be attributed only to a greater obliteration of the facets: this obliteration maytake place when the crystals are formed too quickly, like those obtained by cooling, or by a too precipitate evaporation of alcohol in a hydro-alcoholic solution of valerianate. It also happens, although rarely, when crystals are formed with extraordinary promptitude, by a sudden change of temperature, or by any other cause, it is thus observed that the crystals have the appearance of silky needles which are combined in masses analagous to those of other salts of quinine. I have sometimes obtained these same silky needles by abandoning to spontaneous evaporation at the temperature of 59° F. an aqueous solution of valerianate of quinine. The form of obliterated octohedron is, therefore, most natural to the valerianate of quinine; it is peculiar to this salt which it characterises, for which reason we should attach to it a certain degree of importance.

A concentrated alcoholic solution of valerianate of quinine:—

1. Precipitates the concentrated neutral aqueous solution of nitrate of silver. The precipitate is soluble in a large quantity of water, and it entirely disappears on the addition of a few drops of nitric acid.

2. The aqueous solution of valerianate of quinine does not render turbid a solution of chloride of barium.

3. Submitted to distillation, it allows oleaginous drops of fused hydrated valerianate to deposit.

4. We observe the formation of these same drops and their precipitation in agitating the concentrated aqueous solution of bihydrated valerianate with monohydrated valerianic acid.

5. If the solution be heated, with even weak acids, valerianic acid is separated from it, which may easily be detected by its odor, and if this decomposition be operated with solid valerianate of quinine and an acid in concentrated solution, valerianic acid is obtained under the oleaginous form.

6. A great quantity of water entirely dissolves this acid, if, however, the valerianate of quinine do not contain essence of valerian.

The crystalline form, and the study of chemical re-actions, will readily teach us the impurity or adulteration of valerianate of quinine. The method which appears to me best adapted for the preparation of this salt is the following:—

A very slight excess of valerianic acid, which may be ascertained by means of litmus paper, is poured into a concentrated alcoholic solution of quinine; the alcoholic solution of the valerianate is diluted with about twice its bulk of distilled water. The mixture is agitated, and submitted to evaporation at a gentle heat, which should not exceed 122° F. When a great part of the alcohol is evaporated, the valerianate begins to crystallise, in fine octohedrons, which increase day by day, and which form a single mass only when the evaporation of the liquid is complete.

Other methods give the valerianate more promptly, but it is also more impure, and its crystallisation is less regular.

Whatever method may be employed in this preparation, too strong heat should be avoided, as it might, as we have already stated, cause the oily drops of fused valerianate to separate. However, these drops may easily be converted into crystals, by solution in alcohol, addition of water, and the evaporation of the whole at a very moderate heat.

If the purity of this salt be of no consequence, it may be prepared according to Professor Perretti's process, by double decomposition; for this purpose ordinary sulphate of quinine (which I would always render neutral by the addition of sulphuric acid) and valerianate of lime are used, both in solution in weak alcohol. For economy, we may use valerianate of lime obtained by saturating the distilled water of valerian with lime. The salt of lime thus obtained, never being very pure, is, consequently, not very fit for producing the best valerianate of quinine. It could become such only by means of numerous crystallisations. In order to obtain pure valerianate of lime, it is necessary to saturate the pure acid with lime; but then it would be better and more expeditious to prepare the valerianate of quinine by the direct saturation of the acid with the base.

I may conclude by recommending chemists who are more skilful than myself, to make use of the valerianate of quinine to elucidate the proportional number of that base. The preference which should be given to it is founded on the clearness of the crystalline forms of this salt.

VALERIANATE OF ZINC.

Among the valerianates which I have proposed in therapeutics, and recommended for chemical study, that of zinc particularly merits the attention of practitioners. In the last edition of his *Treatise on Chemistry*, Berzelius describes this compound in these terms:—"A salt crystallised in small bracteæ similar to those of boracic acid, unalterable in air, and fusible without any alteration at 282° F., soluble in water and in alcohol." I have prepared this salt several times, and in order to obtain it with the characters enumerated by Berzelius, the best mode of preparation consists in saturating an aqueous solution of pure valerianic acid with the recently precipitated combination of carbonate and hydrated oxide of zinc. The saturation should be effected by aid of heat; and for this purpose, the neutral or slightly acid liquid is evaporated at a very moderate temperature, not exceeding 122° F.

With these precautions, a salt is obtained crystallised in beautiful bracteæ. A certain degree of importance attaches to this form, which serves as a distinctive character of this salt and that of cadmium, the only known valerianates which crystallises in bracteæ of cadmium, which the valerianate first described greatly resembles that of zinc in its crystalline form. It has, however, less lustre; in equal conditions the volume of the crystals is greater, and it has a greater tendency to crystallise.

The valerianate of silver sometimes takes the form of beautiful bracteæ; such as that obtained by the solution of the pulverulent salt in boiling water, and by abandoning this solution to cooling; but as it is sparingly soluble, and as light blackens it with the greatest ease, it is very well distinguished from the other valerinates.

TOXICOLOGICAL AND CHEMICO-PHARMACEUTICAL EXPERIMENTS ON DIGITALIS.*

BY M. BONJEAN.

DIGITALIS PURPUREA IS NOT A POISON FOR CHICKENS.

Experiments made on dogs and observations collected concerning man, have placed beyond doubt the poisonous action of *Digitalis Purpurea*. Indeed, this substance has constantly caused the death of animals to which a few drachms of it have been administered; and M. Orfila concludes from numerous facts which he has observed on this subject: 1st, that the powder of digitalis, its resinous and aqueous extracts and its tincture should be regarded as energetic poisons; 2nd, that the resinous extract is endowed with more active poisonous properties than the aqueous extract, and that the powder is less powerful than the latter.

I have, in vain, endeavoured to poison chickens by administering to them powerful doses of the powder of digitalis, which produced in these animals, none of the ordinary consequences of swallowing this plant.

FIRST EXPERIMENT.

On the 3rd November, 1842, at 9 o'clock in the morning, I administered to a healthy chicken, which had been kept fasting during the night, two drachms of the powdered leaves of digitalis formed into boluses by means of a little gum and water; six hours afterwards, the animal not experiencing any appreciable effect, I gave it some seeds, which it ate with appetite. On the 4th, the same state of health as before. On the 5th, at 9 o'clock in the morning, 4 drachms of the same powder were administered, but without producing any remarkable action. The animal ate as usual and chirped every morning. Its excrements were the color of digitalis.

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* *Journal de Pharmacie*, July, 1843.

On the 7th, at 9 a.m., I administered to it an ounce of the same powder, and kept it without food until 5 p.m. On the 8th it often laid down, and ate little; but on the 9th, it resumed its ordinary appetite and vivacity, and continued thus until the 12th, when it was killed to be eaten. Its flesh had not any particularly bad taste.

This chicken had taken, in four days, 14 drachms of the powder of digitalis which had been gathered two years. According to the opinion generally admitted in medicine, the age of this plant would be the principal cause of its inertness; we shall see that recently gathered digitalis does not possess a more energetic poisonous action, at least on chickens.

SECOND EXPERIMENT.

On the 25th November, 1842, at 8 a.m., I administered to a healthy chicken, which had fasted since the previous evening, 4 drachms of powdered leaves of digitalis, of that year's crop. On the 26th, morning and evening, I administered each time, an equal quantity of the same powder. On the 27th, the animal had hitherto had no food, except the 12 drachms of the powder, and experienced no symptom except a little weakness. At noon it ate with appetite, and, by the next day, it recovered its former state of health.

On the 8th and 9th December following, for its entire nourishment, an ounce and a half of the same powder of digitalis was given to it, at three different times. The powder was formed into boluses, which formed a very great bulk, and seemed to be difficultly digested by the animal. On the evening of the 9th, it appeared ill; its stomach was considerably swelled, as if it had eaten too much. On the morning of the 10th, I found it dead in its cage: a bluish liquid was flowing from its beak.

Autopsy made at 12 p.m., *by Dr. Chevallay.*—The æsophagus was hung with brownish matters. The stomach was distended by an enormous quantity of the swallowed substance, and its membranes were like parchment. The internal membrane was red, without presenting, however, evident traces of inflammation. The pericardium contained little serosity. The two auricles, as well as the large veins which surround the heart, were filled with blackish blood, as also was the right ventricle of the heart. The lungs were in the healthy state, but a little congested. The liver was in the normal state, only the gall bladder was filled with bile. The veins of the mesentery were full of blackish blood; however, the intestines did not present any signs of phlogosis. The matters found in them were of the same color as those contained in the stomach, but this color was less apparent. The gullet also contained the same matter, with pieces of straw and some grains of stone; it did not present anything peculiar. The spinal marrow exhibited no lesion. The cerebral substance was rather congested, and reddish.

THIRD EXPERIMENT.

From the 24th December, 1842, to the 9th January following, I administered every day to a healthy chicken two drachms of powdered leaves of digitalis of the last crop: in 17 days this animal took four ounces and a quarter of this powder, which produced in it no appreciable action. During these 17 days, it ate as usual, and I used it for the following experiment:—

FOURTH EXPERIMENT.

Two ounces of the powder of recent digitalis were exhausted by alcohol at 33°, by displacement. The solution, which was of a fine green, was distilled in order to remove the greater part of the alcohol, and the residue concentrated to a syrupy consistence, was precipitated by water in order to separate from it the resin. (See Experiment 5.) The filtered liquid was then of a deep dull green, and very bitter. Evaporated to the consistence of a soft extract, this new residue was formed into boluses with a little gum, then administered on the 10th of January, 1843, at 9, a.m., to the chicken which had been the subject of the foregoing experiment. This dose of extract, which contained all the bitter portion and extractive matter of two ounces of digitalis, produced in this animal no morbid symptoms.

FIFTH EXPERIMENT.

On the 11th of January, 1843, at 8, a.m., I administered to the chicken of the two foregoing experiments all the portion precipitated by water from the concentration of the alcoholic treatment of two ounces of powdered digitalis. (See Experiment 4.) The product was a mixture of chlorophylle and resin. The animal was not incommoded by it; it continued to enjoy its usual health.

SIXTH EXPERIMENT.

It remained to ascertain whether the flower of digitalis was as inoffensive as the leaves. For this purpose, from the 13th to the 15th of December, 1842, I administered to a very robust chicken two and a half ounces of powdered flowers of digitalis, taken at four different times in half ounce doses. On the 16th, at 4, p.m., the animal being in good health, I gave it four drachms of powdered leaves of the same plant. On the 17th, it was rather weak, without any other apparent symptom; it had, however, taken, in four days, for its entire nourishment, only four ounces of the powdered flowers and leaves of digitalis. At noon, some grain was given to it, which it ate with appetite, and it continued from that time to enjoy its former state of health.

CONCLUSION.

From the preceding experiments, it results that *digitalis purpurea* does not produce any injurious effect on chickens, to which very large doses of it have been administered, either in powder, or under the form of aqueous or resinous extract. The flower of digitalis does not possess, as a poison, and in the same animals, any more apparent action than the leaf. The death of the chicken of the second experiment is attributable only to indigestion, which very well explains the kind of congestion which was remarked in the autopsy. These results are surprising, when it is considered that six drachms of powdered digitalis are sufficient to cause, in the space of twelve or fifteen hours, the death of a healthy dog of the ordinary size (Orfila, *Traité des Poisons*, 3rd edit, t. ii., p. 285): whilst an ounce and a half or two ounces, administered to chickens in twenty-four hours, do not produce in these animals any morbid phenomenon. The chicken which served for the third experiment took, in seventeen consecutive days, four ounces of powdered digitalis, without being incommoded by it. Can the very nature of the digitalis employed in my experiments be objected to as the cause of this inertness, when physicians daily prove, in my establishment, the efficacy of the same plant as a therapeutic agent? I have had an opportunity of meeting with a fact of this kind in the numerous experiments which I have made on different animals with ergot of rye. Sometimes the oil extracted from this sclerotic immediately acted in the dose of a drachm in chickens, which were thus narcotised in four or five minutes, and died in the space of a few hours; while the same oil, extracted from the same powder, and arising from the same experiment did not produce in these animals any appreciable effect, even in a dose of two, three, or four drachms. In the latter case, the poison confined itself to producing a simple local irritation, and completely passed off, without being absorbed, in the stools, where the oil was found an hour and a half or two hours after having been swallowed. M. Gasparin has lately announced to the Academy of Sciences of Paris, that arsenious acid was not a poison for sheep affected with pleurisy: I now announce a fact, if not as important in its consequences, at least as curious, viz., that purple digitalis, which is a poison to man and dogs, does not exert on healthy chickens any sensible action.

RESULTS OF SOME CHEMICO-PHARMACEUTICAL EXPERIMENTS ON THE SAME PLANT.

When the powder of the leaves of digitalis is heated by water and by displacement, a very bitter solution is obtained, which contains almost the whole of the active principles of this plant. By suitably acidulating the solution with sulphuric acid, a green resin is separated from it, in which the diuretic properties of digitalis appear to reside. This resin is insoluble in ether, soluble in aqueous alcohol, and the alcoholic solution may be mixed in all proportions with water, without the resin being precipitated, although water does not dissolve it.

The powder of digitalis, exhausted by water, afterwards yields to alcohol all the chlorophylle mixed with a new portion of resin, which appears to be of the same nature as that which sulphuric acid precipitates from its aqueous solution of this powder. After this double treatment, the digitalis is reduced by about half its weight. The powder, exhausted by water and alcohol, contains only very little green coloring matter, or chlorophylle, which may easily be isolated by means of sulphuric ether.

One ounce of powder of digitalis furnishes about 18 or 20 grains of green resin, and 14 or 15 grains of chlorophylle. It is to this latter substance that the tincture of digitalis of the shops owes its beautiful blue color. It is easy to see, from that, that this color should have no influence on the property of the medicine, and that the tincture will be so much the more rich in green coloring matter as the alcohol employed in its preparation contains less water.

To be efficacious, as much as it can be at least, tincture of digitalis should be prepared with alcohol at 20 or 22 degrees, and not with alcohol at 91 degrees, as recommended by all authors. I regard the aqueous extract as the most certain and energetic of all the preparations of this plant.

The ether which is caused to act directly on the powder of digitalis, extracts from it all the chlorophylle, and extracts from it only that; a tincture of a superb green is thus obtained, but entirely deprived of medical properties, contrary to the opinion of MM. Le Royer of Geneva, Planavia, and others, who regard ether as the best solvent of the active principle of digitalis.

For my part, I am convinced that the ethereal tincture of digitalis possesses no other properties than those which belong to ether itself.

ON SYRUP OF BALSAM OF TOLU.*

BY E. SOUBEIRAN.

M. E. Marchand, of Fécamp, has proposed the following formula for the preparation of Syrup of Balsam of Tolu:—

℞ Balsam of Tolu........	16
White sugar..........	32
Cold water............	60
Cold simple syrup........	1,000

Triturate the balsam with the sugar to make an impalpable powder, place it in a pot of earthenware or tin, mix with water, and add the syrup carried to ebullition. Agitate from time to time, until cold; cover during repose, and filter through paper after 12 hours' contact.

M. Marchand wished, by this formula, to arrive at diminishing the dose of balsam of Tolu, at the same time obtaining as advantageous a product; he thought the simple syrup acting on the balsam divided by the sugar, would be surely more apt to dissolve the soluble parts, than pure water.

The syrup made by this formula is agreeable, but what syrup of Tolu is not so? I consider it weaker and less sweet than that of the codex. It is to be regretted, that M. Marchand did not compare the two syrups; it might have been the means of his establishing an exact comparison.

The codex orders the balsam of Tolu and the sugar to be employed in the proportion of 1 to 8. According to M. Deville's observation, I have ascertained by experiment, that, without changing the qualities of the syrup, this proportion might be reduced to half, consequently adopting that of 1 to 16. M. Marchand reduces it to 1 to 44. After having ascertained by a first experiment that M. Marchand's syrup was not sufficiently charged, I made another according to his formula, employing one-fourth of the balsam, prescribed by the codex. I was already aware that in this proportion the taste and odor of the product are too weak when it is prepared by the direct action of water on balsam of Tolu. I therefore followed the manipulation recommended by M. Marchand. This time I obtained a syrup more highly charged, which several persons found good and agreeable, but only until I made them taste, comparatively, the syrup of the codex, The latter has a sweet perfume and taste, which M. Marchand's syrup is very far from possessing. The latter offends, by its odor, and by its resinous acridness. An experienced person cannot for an instant hesitate between the two products. I recommend the employment of balsam of Tolu in the proportion of 1 to 16, and the preparation of a first liquor, by the digestion of the balsam of a previous operation, and that this infusion be used for treating a fresh quantity of new balsam.

ON THE KIND OF DEATH DETERMINED BY HYDROCYANIC ACID, AND THE SUBSTANCES WHICH CONTAIN IT.*

BY DR. HAYN.

In the observations of cases of poisoning by hydrocyanic acid, which have hitherto been published, the rapidity of death, almost instantaneously supervening, prevented the verification of the reality of certain peculiarities observed by Orfila, Viborg, Krimmer, &c., in their experiments on animals, viz: that the primary action of hydrocyanic acid especially consisted in a decomposition of the constituent principles of the blood, that the spinal marrow and the vague nerve, were only secondarily affected in their motive functions; and, finally, that the paralysis of the respiratory apparatus was only the result of this pathological modification of the spinal marrow and vague nerve. It is, therefore, not uninteresting to make known a case of poisoning of this kind in which the slow poisonous effect admitted of the *modus operandi* being ascertained in a very positive manner.

An hypochondriac, of very advanced age, drank one morning about 45 grammes of hydrolate of cherry-laurel. He had had an opportunity of procuring this liquid beforehand, and when symptoms of poisoning manifested themselves, he did not endeavor in any way to deny the cause to which they were due. These symptoms, which did not show themselves until three hours after the poison had been swallowed, were as following:—Paralysis of the hands and feet, head strongly inclined forwards, without it being possible for the patient to hold it erect; involuntary excretion of urine and stools; the extremities, although immovable and cold, had not, however, lost their sensibility; the pulse was small; the voice hoarse, but distinct; the intellectual faculties were perfectly intact.

The patient observed with satisfaction the incessant progress of the weakness which he experienced; notwithstanding all the care lavished on him, he died towards evening, without pain or convulsions, of paralysis of the lungs.

On *post mortem* examination, the blood was found gluey, and of a very peculiar, dark color; but it was impossible to detect the order proper to bitter almonds, which, moreover, as is known, is not a constant characteristic.

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* *Journal de Pharmacie*, July, 1843.

* *Hufelaud's Journal.*

JUNIOR DRUG CLUB.

The monthly meeting of the above club was held as usual at the King's Arms Tavern, Snowhill, on Wednesday the 2nd of August ultimo, when a very valuable paper on extracts, and the various methods which have been proposed for their preparation, was read by Mr. Mowbray, and to the report of which we refer our readers as contained in another part of this number.

At the conclusion of the paper, Mr. Whipple addressed the meeting, commenting on the too frequent practise of modern writers on pharmarcy, who put the evaporating pan on paper instead of the fire, and whose imagination bodied forth results which 20 years' experience as a laboratory man assured him could not be obtained. It had not been the practice of the society there assembled to publish their papers hitherto, probably from an excess of humility; but from such a course, he begged to remind them, they lost the advantage of referring at any future time to the experience of the members; under these circumstances he would beg that his friend who had just addressed them, would furnish such details to a gentleman whom he observed taking notes, as would enable him to publish a report of the paper, as well as the meeting, and he would conclude by moving a vote of thanks for the very able paper which had been communicated to them.

Mr. Cort seconded the motion, and in so doing he felt that much good would result from the publicity being given to the details which that evening had been communicated to them; by many it was supposed the assistants were inattentive to improvement in the details of their profession, but he felt the numbers who had enrolled themselves, and paid subscriptions with a view to their organisation, was the best answer to such a charge.

A vote of thanks to Mr. Mowbray was then put and carried, and that gentleman briefly acknowledged the same, and reminded the members then present, that, although chemical research was not at present such a valuable aid in advancing their position, as the cultivation of habits of punctuality and promptitude in the various departments in which they were engaged, for that those were present whose experience had taught them, that he who could rapidly form in a day a certain number of 14lb parcels, and label them in a bold *back hand*, would obtain sooner, and hold longer, a position, than he whose excellence was confined to quantitative analysis and symbolic notation; still it could not be denied, whatever the position, it was a source of satisfaction to investigate thoroughly the theory of the processes we are called upon to perform; and to account for the changes which ensue during the operations of pharmacy was to control and improve these processes. He had ever felt the greatest delight in such habits, and he did not think they were calculated to lower him in the opinion of those gentlemen whose evaporating pans, as his friend expressed it, were too often made to boil with paper, and whose results, as described by themselves, none can be found to corroborate.

Owing to the lateness of the hour, Mr. Whipple next moved, that any remarks of those present, suggested by the reading of the paper alluded to, be deferred until the next meeting (Sept. 6th). After which several members were elected, thanks were voted to the chairman, and the meeting broke up.

[The importance of papers emanating from those who work by the hundred weight and ton will be at once conceded. We are at a loss to understand how it is that such a valuable source of information has been neglected by the Pharmaceutical Society. The value of some of the papers that have appeared in the Society's transactions, on the subject chosen by the author of the above paper, will be gathered by a perusal of the impracticabilities particularised therein, and to which our readers are referred.—Eds.]

[Owing to our being disappointed in obtaining the engravings necessary for the illustration of Mr. Mowbray's paper, we are unwillingly compelled to defer its completion until the next number.—Eds. Chem.]

TREATMENT OF SCHIRRUS AND CANCER.*

Reitz treats schirrus and cancer in the same manner when these diseases appear to be the consequence of a dyscrasy of the humours, when surgical operation is not indicated, or when it may be attended with danger.

His remedy, known under the name of *Reitz's Acid Compound*, is prepared in the following manner:—

℞ Nitric acid	125 parts.
Hydrochloric acid	8 ,,
Sulphuric ether	8 ,,
Borate of soda	6 ,,

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* *Gauger's Repertorium der Pharmacie, &c., in Russland.*

These different substances are mixed in a glass bottle of the capacity of from 500 to 700 grammes, which must be imperfectly corked, and left to itself for a few hours. In this interval, vapors and numerous bubbles of gas are disengaged. When the mixture has acquired a greyish tint, it is poured into small phials.

It is employed internally, externally, and in injections.

For internal use—One part of this mixture is diluted with two parts of alcoholised sulphuric ether, and ten drops of it are administered in a sufficient quantity of water, suitably sweetened.

For external use—Four grammes of the mixture are added to sixty grammes of sweet fat oil, and a liniment is formed by agitation.

For injections—Two grammes of the mixture are diluted with five hundred grammes of distilled water, and tincture of opium is added to it in such proportion as the case may require.

ON THE USE OF MALT LIQUORS.

To the Editors of The Chemist.

GENTLEMEN,

I cannot refrain from making a few remarks on the letter of your correspondent "Medicus," inserted in THE CHEMIST, for August, on the above subject. I trust some one better qualified for the task will reply to him at greater length, as the subject has assumed an aspect of great importance, whether we look at it in a moral or physical point of view. I think we have abundant evidence of the evils arising from "*the moderate use of wine and beer*" to satisfy us that the principle of total abstinence is right, and to deter us from continuing the contrary practice.

I trust the readers of THE CHEMIST will not allow themselves to be carried away by a great name; much as we are indebted to Dr. Pereira for his labors in Materia Medica and Chemistry, there is a possibility of his being in error on this point. I trust they will not rest satisfied with the *ipse dixit* of either Dr. Pereira or any other man, but look carefully at the subject on all sides, and decide the question, to the best of their ability, on its own merits, not on the merits of the advocates on either side.

In reply to Dr. Pereira, let them take Dr. Lees' Illustrated History of Alcohol, now in course of publication (see advertisement on cover of THE CHEMIST for August); also Dr. Prout's Experiments on Alcohol, given as an appendix to Dr. Lees' work, and the discussion between Dr. Lees and Mr. Jeafferson, which is also added as an appendix to Dr. L.'s publication. These appendices are also published in a separate form, and may be had by post on enclosing 6d. to the author, Dr. F. R. Lees, Leeds. The speech of Dr. Beaumont, of Bradford, at the meeting at York, also contains highly important testimony on the subject. It is reported in the *Temperance Herald* of 27th July, 1843: So much in reply to Dr. Pereira.

But what says "Medicus"? He says—"Common consent goes a great way with me. About nine men in ten, perhaps ninety-nine in a hundred, either at or after dinner, partake of some beverage containing alcohol."

I would ask, what does this prove? I think, nothing in favor of the practice. It is said, "Thou shalt not follow the multitude to do evil." Now, I would ask "Medicus" if one in ten, or one in a a hundred, of these drinkers of alcholic beverages are entirely free from diseases of the stomach, or liver, or some of the organs or tissues concerned in the digestion or assimilation of the food? I think it is a fact that they are not, and I look upon his fact and mine as cause and effect.

Again, "Medicus" states, twice over, that he does not advocate the use of ardent spirits (even in moderation), "but only the *moderate use* of wine and beer, and those of the best quality (such as the *India pale ale*), and taken within the hours of 12 at noon and 9, p.m., and (mark this) never when the stomach is empty, as in that case there would DOUBTLESS be *local chemical action on the coats of the stomach*, the unfortunate consequences of which I have frequently observed." What! Am I to understand that these "unfortunate consequences" ensued from taking, "in moderation," the "India pale ale," that most valuable restorative beverage for invalids and convalescents? (Vide the quotation of "Medicus" from Dr. Pereira). Now, I have always supposed that no chemical action could take place between any of the tissues and other bodies until the vital principle had been destroyed—even the gastric juice has no local action on the coats of the stomach whilst life remains; and dare "Medicus" advocate the use of an article as a beverage which he believes capable, if it comes in contact with the coats of the stomach, of producing disorganisation! decomposition! destruction! death!—for such I presume must be the meaning of "local chemical action"; or can "Medicus" suppose that any body else will believe that food or anything else in the stomach will prevent the India pale ale from coming in contact with its coats?

Fervently hoping that many may be induced to seek after the truth on this subject by this discussion,

I remain,
Respectfully yours,
CHEMICUS.

August 5th, 1843.

ON THE SALE OF POISONS, AND THE PHARMACEUTICAL SOCIETY.

To the Editors of the Chemist.

GENTLEMEN,

Every day convinces me more and more of the necessity of some stringent steps being taken to correct the growing evil of the indiscriminate and careless sale of poisons. I am stengthened in this opinion by the statistics of crime, as evinced by the recent trials at the assizes, independent of the numerous cases brought before the Central Criminal Court. The greatest facility still exists in the sale of these fatal articles: I need only refer, in confirmation of what I assert, to the newspaper accounts of the trials throughout the country.

Dr. Ure animadverted in very severe, but perfectly just, terms, to this palpable facility of procuring poisons, in a case of attempt to poison, by means of oxalic acid, which he was called in professionally to analyse. Can you inform your readers, Gentlemen, if the "Chartered Society," established professedly for the advancement of science, and the protection of druggists, have yet done aught towards remedying this evil, and rescuing the sale of drugs generally from those who are totally unqualified from vending the same by reason of their gross ignorance? If they have neglected so important a duty, it is high time they should be told of their almost *criminal* neglect, in not stepping forward to urge the Legislature to enact some law to prevent (as far as possible) the dreadful sacrifice of life by these horrid means.

Although I have called your attention to this subject in some former numbers of THE CHEMIST, perhaps you will insert these few remarks in your next number.

I am, Gentlemen,
Yours respectfully,
August 15. PATIOTICUS.

[We are not aware of the Pharmaceutical Society having taken any steps in the matter. EDS.]

LISFRANC'S VERMIFUGE DECOCTION.*

℞ Semen contra	15 parts.
Common water	180 ,,

Boil for a few minutes, then remove from the fire and add:—

Corsican moss	15 grammes.

Infuse, in a close vessel, until perfectly cold, and strain through linen, with strong pressure.

This decoction is successfully employed by M. Lisfranc, in cases where the gastro-intestinal canal contains entozoa of different species, especially lumbricæ.

It is given at night, immediately before retiring to rest.

COLLYRIUM OF BELLADONNA.†

BY M. DESMARRES.

℞ Leaves of belladonna	50 grammes.
Leaves of hyosciamus	50 ,,
Boiling water	1 quart.

Infuse, in a close vessel, until perfectly cold; strain with strong pressure, and add to the mixture:—

Extract of belladonna without fecular	28 grammes.

Dissolve, then filter the solution, in a bottle, and keep its immersed in ice. (This collyrium is employed in cases of recent hernia of the iris, of traumatic origin or consecutive to ulcerations of the cornea, and in these ulcerations themselves, when perforation is imminent.)

A compress imbued with this liquid is applied, every five minutes, to the diseased eye; and, every time that it is renewed, a drop of the collyrium is poured between the eye-lids. To facilitate these applications the patient should lie on the back.

NEW FORMULA FOR ALMOND SYRUP.‡

BY DR. HAEUSLER.

℞ Sweet almonds	125 parts.
Bitter almonds	60 ,,
Very white sugar	625 ,,
Filtered spring water	450 ,,

The almonds are blanched, then pounded with 180 parts of sugar, until the oil begins to separate. An emulsion is then made with water, and the remainder of the sugar, previously reduced to powder, is added.

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* *Journal de Chimie Médicale*, August, 1843.

† *Journal de Chimie Médicale*, August, 1843.

‡ *Jahrbuch für praktische Pharmacie.*

The author states that the almond syrup, thus prepared, always remains perfectly homogeneous, and that it may be kept for a very long time.

REMEDIAL APPLICATION FOR SORE NIPPLES.*

BY DR. DOBROWOLSKY.

Dr. D. recommends the application of the following mixture to chaps of the nipple :—

℞ Balsam of Peru ...... 4 grammes.
Rectified spirit ...... 30 ,,

The whole of the ulcerated surface of the nipple is anointed with it, by means of a hair pencil, after the nurse has given suck. Before presenting the breast to the child, it is necessary to wash it with tepid water, in order to remove the layer formed by the liniment.

IMPROVED FERRUGINOUS PREPARATION.†

BY M. DE HERRYPON.

This improved medicinal compound is a mixture or combination of ferruginous preparations with farinaceous matters, intended to be taken into the stomach by way of food, in the form of bread, biscuits, or cakes.

The invention is carried into effect by the following means :—A given quantity of ferruginous preparation (say of the soluble salts of iron) is to be dissolved in a suitable quantity of water, and this water, so impregnated with the iron, is to be employed as the menstruum or liquid for mixing up a given quantity of flour into dough. The proportions of the iron to the flour must be according to the complaint, disease, or physical state of the patient, and may be regulated by the advice of the physician or other medical attendant. The dough, so prepared, having been properly kneaded, is to be baked into bread, biscuits, cakes, or other suitable form, and is then fit to be eaten by the patient, as an ordinary article of food, as part of his or her daily aliment. By such an administration of the iron, in small quantities, the consitution of the patient will be gradually restored to its natural tone of health and vigor, and in a much more effective and agrecable manner than if taken in doses by the ordinary means of solution, or by other modes.

This medicinal compound, when made up in the form of biscuits, may be readily carried and used at sea, or upon a journey, as an article of food, and may be continually taken by persons suffering under the complaints above alluded to. In hospitals, and in the army and navy, under circumstances of extensive prevailing disorders among the men, such as scurvy, this mode of introducing iron and other suitable medicine into bread and biscuits, subject to the directions of the medical adviser will be found to be extremely convenient and efficacious; and the materials may be so mixed that the patients shall not be aware of the bread which they are eating, being medicated.

The proportionate quantities of the preparations, to be mixed with the flour employed for making the bread, should be regulated, as above mentioned, by the advice of the medical man, as it is impossible to give any definite directions; for in all cases, the quantities must depend upon the state or character of the disease to be combated, and of the particular preparations of iron and other matters employed to arrest the disease, or to restore the constitution to health and vigor.

[A patent for this medicine has been granted to Mr. W. Newton, patent agent, Chancery-lane, as the representative of M. de Herrypon.—Eds.]

CAPSULES OF COPAIBA AND RHATANY.

BY MR. A. J. COOLEY.

Ricord has recommended capsules of copaiba, coated with extract of rhatany, as much superior to the common ones of copaiba alone, in the treatment of blennorrhœa. They may be easily prepared by either of the two following methods :—

1. By immersing, for an instant, the common capsules in the following composition; or,

2. By forming the bodies of the capsules with the *composition*, instead of with *gelatine*, and following the same manipulations as for the manufacture of the common gelatine capsules :—

THE RHATANY COMPOSITION.

℞ Ext. rhatan., newly prepared from the root, } 3 part
Syrup of moist sugar . . . 1 ,,
Mucilage of gum Arabic . . 1 ,,

Melt the extract and reduce it in a water bath until sufficiently stiff, when cold; do the same with the syrup and gum; then mix them together while hot, but only in such quantity as may be used at one time.

These capsules are said to sit well upon the stomach, the tone of which they contribute to improve.

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* *Schmidt's Jahrbucher.*

† *Newton's London Journal,* August, 1843.

ADULTERATION OF OPIUM.

An Armenian, who had been for many years engaged in the extraction of opium, informed M. Landerer, of Athens, that one of the adulterations of opium consisted in mixing it, in the soft and fresh state, with grapes well crushed and freed from their stones. He assured him that not a single cake of opium comes from the East without having undergone this adulteration.

Another adulteration consists in pounding, in a stone mortar, the epidermis of the capsules and stalks of poppies with white of egg, and in incorporating this mixture, in certain proportions, with opium.

ELECTUARY OF TURPENTINE.*

BY M. BOUCHARDAT.

℞ Gum Arabic . . .	10
Mix with water . .	10
Add white honey . .	50
Then, essence of turpentine	50
Carbonate of magnesia	Q.S.

F. S. A. an electuary of a soft consistence.

To be administered, in the dose of from 2 to 10 grammes per diem, in unleavened bread.

From the example of M. Royer, it is sometimes useful to associate with this formula a small proportion of opium, or Rousseau's laudanum, 10 or 12 drops, which is added to the mucilage, for all the foregoing dose.

THERAPEUTICAL EMPLOYMENT OF VANILLA.†

BY DR. HERSCHMANN.

Dr. Hershmann extols this substance as a medicament, and, according to him, the practitioners of the present age have done wrong in allowing it to sink into oblivion. He affirms that he is fully convinced of the remarkable effects which may be obtained from its employment in the treatment of adynamic fevers, and especially in the cases of hysterics. He prescribes vanilla under the form of infusion, prepared in close vessels, with from 1 to 4 parts of substance to 100 or 150 parts of boiling water. This quantity, properly edulcorated, is administered by spoonfuls in the course of the twenty-four hours.

PREPARATION OF HYDROCHLORATE OF MORPHIA.

M. Michiels, of Antwerp, advises the following process for preparing the hydrochlorate of morphia. He obtained, by ten ounces, more of the salt from 50 kilogrammes of opium than he would have procured by Gregory's process. Ten kilogrammes of opium are treated with a sufficient quantity of cold water by the displacement method. The opium having been exhausted, and the solution filtered clear, it is concentrated at a moderate heat, until about eight quarts only remain, when a slight excess of a concentrated solution of the chloruret of calcium is to be added. The mixture having been heated for an hour, at 175° F., and continually stirred, the meconate of morphia is totally decomposed, and a white precipitate of meconate of lime takes place, which can be separated by filtration. The liquid is then passed boiling over purified animal charcoal; then concentrated, and a large excess of hydrochloric acid added, by which a confused crystallisaton of hydrochlorate of morphia and codeine is very soon obtained. The salt is collected, and pressed. As it is impossible to obtain all the morphia from the syrupy mother-water by a second crystallisation, it must be diluted with water, and boiled, when the morphia may be precipitated by ammonia diluted with water. This morphia, previously washed, is saturated with diluted hydrochloric acid, and added to the salt previously procured. The whole is then decomposed by ammonia, which precipitates almost all the morphia, leaving the codeine, and some morphia in the solution. The precipitated morphia is then saturated with diluted hydrochloric acid, when the narcotine will be separated, unless an excess of acid be used; after which, the liquid having been filtered, and a large excess of hydrochloric acid added, the morphia will speedily crystallise. The collected salt is submitted to the press, and about 3-4ths of a pure white salt will be obtained. The mother-water is again precipitated by ammonia, as at first, and the same process of crystallisation is adopted. It is so speedy, that it can be practised several times in a day, whereas, previously, a day was required for each crystallisation. If other salts of morphia are required, the solution of the hydrochlorate must be decomposed by diluted ammonia.

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* *L'Expérience*, July 6, 1843.

† *Sachs's Allgem. Medicin, Central-Zeitung*

THE BEBEERU-TREE OF BRITISH GUIANA.

The bark of this tree occurs in large flat pieces, one or two feet long, and varying in breadth from two to six inches. It is about four inches thick, of a cinnamon-brown color, without aroma, pungency, or acrimony, but a strong persistent bitter taste, with considerable astringency. It contains two distinct alkaloids, one called bebeerine, the other sipeerine, and a crystallisable diliquescent organic acid, which appears to differ from all known vegetable acids, and to which Dr. Maclagan has given the name of bebeeric acid. Bebeerine in mass or powder is opaque; in thin layers; it is in the form of transparent yellow shining film. Its taste is strongly and permanently bitter, with a slightly resinous flavor, and it evolves feebly a corresponding odor, when united with sulphuric acid. It is soluble in five times its weight of absolute alcohol, and also in rectified and proof spirit and ether, but very sparingly so in water. It forms soluble uncrystallisable salts with sulphuric, hydrochloric, and acetic acids, but nitric acid decomposes it, converting it into a substance somewhat analogous to carbazotic acid. Sipeerine is of a dark brown shining aspect. It forms uncrystallisable neutral salts with acids. Pure bebeeric acid is white, and beautifully crystalline. It rapidly diliquesces; fuses at 300 deg.; and at 400 deg. sublimes apparently unchanged. The sulphate of bebeerine has been tried at Demerara, with marked success, in the treatment of intermittent fever. Dr. Maglagan has likewise tried it in some cases of ague, and also in periodic headache, and the results obtained were such as to leave no doubt as to its antiperiodic powers. Dr. Maclaglan believes Dr. Warburg's fever drops to be a tincture of bebeer, probably from the seeds. His opinion is formed from chemical analysis. Dr. Pritchett, who tried these drops, in Africa, considers them to be a compound of *morphia and quinine.*

OIL EXTRACTED FROM ERGOT OF RYE.*

BY M. BONJEAN.

This oil, which may be extracted from the ergot in the proportion of from 32 to 35 per cent., is thick, lighter than water, naturally white, but ordinarily possessing a slight yellow color, owing to the presence of a small quantity of resin. Its taste, at first insipid in a state of purity, finally leaves bitterness in the throat. It is insoluble in water, and in boiling alcohol; very soluble, on the contrary, in cold ether. It acts absolutely on animals like the ergot itself; however, its energetic properties may be singularly modified by a heat of 80° to 100° C. Thus to obtain this substance with all the virtue which characterises it as a poison, the ergot reduced to powder must be heated directly by cold ether, and the ethereal solution must be evaporated in the open air; the oil thus obtained is mixed with a little inert brown resin. If, on the contrary, the ergot of rye be first submitted to the action of alcohol, at the boiling temperature, the oil which is extracted from it is found almost wholly converted into brown resin, and no longer possesses any poisonous properties.

When well prepared, the oil of ergot appears to carry its action directly to the brain and nervous system; it may be advantageously employed in the affections of which these organs are the seat, or at least, the *point de départ*, such as paralysis, paraplegia, &c., and against which the ergot of rye in substance has been successfully employed.

MERCURIAL OINTMENT IN SMALL-POX.

Dr. Stewardson has made a careful trial of the application of the strong and diluted mercurial ointment over the *locale* of the small-pox pustules to prevent their maturation, from which he concludes, if appled on the third day, by spreading it upon a piece of thick muslin, previously shaped like a mask, with apertures for the eyes, nose, and mouth, and extending from the ears, and roots of the hair, to the lower margin of the jaw, and kept in its place by strings attached to its posterior margin, and tied across the back of the head and neck, it is decidely beneficial, not merely in lessening the liability to cicatrices, but in diminishing the swelling, and preventing the formation of thick crusts. That by its use pitting may be entirely prevented, or the mortality of the small-pox materially lessened, seems to him very doubtful. M. Briquet advises, that the crevices around the alæ of the nose, its point, &c., to which the mask cannot be kept constantly applied, should be previously smeared over with the ointment, and further, that the mask should be occasionally removed, and re-anointed. There is very little cause to apprehend salivation from this application. Trials

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[*] *Journal de Chimie Médicale,* June, 1843.

were made by Dr. Stewardson with simple cerate and lard, but they were decided failures.

CONTINENTAL TREATMENT OF NEURALGIA.

Dr. Schleiser, of Peitz, has prescribed, with success, to patients with abdominal neuralgia, but whose circumstances would not permit of their visiting a watering-place, the use of an artificial mineral water, resembling that of Eger, in Bohemia, and made as follows :—

℞ Filtered spring water, a pint; diluted sulphuric acid, two drachms and a half; hydrochloric acid, twenty drops. Mix, and add bicarbonate of soda, forty-five grains. The bottles are then to be sealed up without delay, and kept cool; one or two pints may be drunk daily.

In hepatic neuralgia, Dr. Schleiser depends much on the effects of belladonna; in cases where great irritability of the stomach is present, he finds nitrate of silver suitable, combined with morphia.

Morphia has been an ordinary remedy for neuralgia, the cure of which it may, in certain cases, effect; but a French practitioner, M. Rougier, has advised the adoption of an ingenious method, which he says will prove the completeness and permanence of the cure. After the apparent removal of the disease by the morphia, he administers successive small doses of strychnia, gradually increasing the amount of the doses and abridging the intervals between them. Now, if the cure have been complete, the tremors and other characteristic effects of the strychnia go on diminishing in intensity from the first, notwithstanding the increasing strength and frequency of the doses; but if otherwise, a contrary result happens, and the effects of the strychnia increase in intensity.

DEATH OF THE INVENTOR OF HOMŒOPATHY.*

It appears that old Hahnemann, the inventor of the homœopathy humbug, is dead, having protracted his existence, by infinitesimal doses of nothing, to eighty-eight years, greatly to the consolation and edification of the patrons and patronesses of quacks and quackery. The newspapers give the following account of his life and adventures :—

"Dr. Hahnemann was born in 1755 at Meissen, of poor parents, and owed his education to the great aptitude for learning he gave evidence of at the little school where he was first placed. He was received doctor in physic at Heidelberg in 1781, and discovered in 1790 the new system which he afterwards designated homœopathy. He continued until 1820 his experiments and researches on his new system, and then published the results of his labours, under the title of *Matière Médicale Pure.* In 1829 he published his *Theory of Chronic Diseases and their Remedies*, of which he gave a second edition in 1840. To those works must be added his *Organon de l'Art de Guérir*, which ran through five editions. He also published nearly 200 dissertations on different medical subjects; and he did all this whilst occupied with patients, which took up from ten to twelve hours a-day. He had the satisfaction of seeing his system, after half a century's existence, spread over every part of the globe; and just before his death he learned that homœopathy was about to have a chair at the University of Vienna, and hospitals in all the Austrian States, at Berlin, and at London."

"He owed his education to his great aptitude for learning." What a prodigiously fine little fellow! But this is the history of all the heroes who have had their lives written. When some of his disciples come to compose his eulogium at large, we shall certainly have it recorded, that when a mere infant he built his mud pies of a most enduring mortar, composed of a pinch of lime to a heap of road scrapings, and that his great delight was to poison his grandmother's ducks by stirring the water of the pond with the brass ferule on the end of his grandpapa's walking staff. "He was received doctor in physic at Heidelberg," says the *Commerce*, which does not surprise us, seeing that this same Heidelburg is, we believe, one of the diploma shops of Germany, where gentlemen who "go up the Rhine" for High Dutch medical honours rejoice to find them. But above all things he "*discovered*" in 1790 the "new system," which he afterwards designated homœopathy, and a notable discovery it was for him and his disciples, enabling them to carry on a system of a cheating with homicide, in defiance of the laws, and without fear of God or man. It was not, however, a new discovery, but a verification of a long-established truth, that there is no absurdity or wickedness too great or extravagant for the credulous multitude to adopt; no form of iniquitous quackery, which, if plausibly and boldly put forward, will not secure its devotees and patrons. There were, and probably are, among the dealers in this form of imposture some feeble-minded creatures, incapable of distinguishing the most obvious truth from the most palpable falsehood, who believe, or persuade themselves that they believe, what they assert to be true respecting this "system;" but the great majority of them know well that the success of their schemes rests upon the fact, which every one admits, that diseases are neither necessarily fatal nor necessarily permanent, but, on the contrary, that the greater portion of them disappear as they came, without our being able to assign a reason, and that the business of the physician is very often merely to look on and watch the progress of the mischief, reserving his remedies until necessity demands them. Instead, however, of honestly and fairly admitting this, these mean, unprincipled fellows invent a plausible lie, and tell the sufferer from some trivial malady that they, not nature, cure them, and that the same remedy which is thus successful in one is successful in all cases; a position which compels them to resort to a course still more criminal and culpable. To establish their "system," they are driven to the obvious alternative of relying on it exclusively, or occasionally resorting to some other—a course which would shake confidence in its universal applicability, and so spoil the speculation. They therefore boldly undertake to arrest the most formidable diseases by the same trumpery remedies with which they pretend to have cured trivial maladies, and the consequence is, that in so doing, they are the cause of much loss of life and permanent injury of health. This, however, seems neither to give nor cause them any trouble. Death has no terrors for them, provided the "system" works, and the money comes in. That men should be found so wicked and abandoned is nothing wonderful, but that such practices should be tolerated by civilised nations is surprising. The case is simply this—a man is attacked by disease, the treatment of which is well understood, and its cure for such treatment all but certain; a person pretending to cure this disease by other means is called in, and instead of adopting the proper treatment, subjects the sufferer to a process which he knows well is not so efficacious, or indeed efficacious at all, and the man dies. The question now arises as to the cause of death, and with it the question whether it is lawful to be accessory to this death by thus withholding the means of preventing it? no matter whether or not it is the "system," or, in other words, the trade or calling of the party accused. That a man so acting is guilty of manslaughter, culpable homicide, or even murder, we have no doubt; and that certain folk, who ride in their coaches, and live in fine houses, on the wages of their iniquities in this way, should be expiating their crimes in Australia, we have also no doubt; but circumstances alter cases, and criminals, patronised by silly lords and conceited ladies, are not to be treated like vulgar felons. Oh! but then says the recorder of old Hahnemann's merits, he continued his "experiments for thirty years," and then "published" the results of his labours in a book which ran through five editions. What a convincing proof of the truth of his "system!" The book was, in fact, his advertisement, and the five editions part and parcel of his stock in trade. But he had the satisfaction to learn just before his death that homœopathy was about to "have a chair" at the University of Vienna, and hospitals in all the Austrian States, and at Berlin, which may, for aught we know to the contrary, be the case, seeing that the countries which afford the Mesmers, and Hahnemanns, and the Priessnitzs, are very likely to erect asylums for the victims of their impostures. In fact, the Germans are a dreaming, credulous people, simple, sincere, and generally honest; but of all the people in the world they are the last from whom we would select a committee to inquire into the truth of homœopathy, hydropathy, or animal magnetism, or indeed of any other 'pathy which has vague surmises, and unproved assertions for its foundation, and flimsy theories for its support. There is also to be a "chair" in London, says the biographer; and nothing is more propable; if anything was to be gained by it, we believe that a chair might be found in London for any professor of any branch of industry.

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* *Dublin Medical Press.*

NEW PURGATIVE AERATED SEA WATER.*

An apothecary of Fécamp, on the coast of Normandy, has added to pharmacy a new preparation, which he calls *eau de mer gazeuse*. He procures sea water at some leagues' distance from the shore, and from a certain depth; this he filters, to deprive it of its animal and vegetable impurities, which prevents its keeping wholesome, and he then charges it, like soda water, with carbonic acid. The preparation thus formed has been submitted to the French Academy of Medicines, and M. Royer has reported that it is a stronger purgative than seidlitz water; that it may be taken without repugnance, and is even agreeable to the taste of some; that no inconvenience has, in his experience, resulted from its use; and that it appears to exert a favourable effect in scrofulous patients. This testimony would seem to be decided and satisfactory enough on behalf of the preparation; but, as if litigation and splitting straws were to be the perpetual characteristics of French debates, the Academy would not suffer a recommendation of the article in question to proceed from it until the word *purification* had been expunged, and the *filtration* substituted in the detail of the process by which the animal and vegetable impurities are removed from the water.

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* *Gazette Medicale, and Lancet*, Aug. 26.

PROUT'S URINOMETER, WITH RONKETTI'S TESTING APPARATUS.

We have received from Mr. John G. H. Ronketti, of Great Russell Street, Bloomsbury, a complete set of the above apparatus, and feel great pleasure in testifying to the accuracy of the instruments.

The case contains Prout's urinometer, a thermometer, a nitric acid bottle, a spirit lamp, test tubes, litmus paper, and a pipette.

We recommend such of our readers as may occasionally require to examine urine, to possess themselves of this useful apparatus.

THE PHARMACEUTICAL SOCIETY IN LIVERPOOL AND MANCHESTER.

At the very moment of going to press, we have received information from Liverpool, that the Pharmaceutical Society is giving great dissatisfaction in that town, Manchester, and the vicinity. We know that under the present management it must be so.

AMMONIA AS AN APPLICATION TO BRUISES, &c.

A German practitioner strongly recommends spirit of ammonia as a local application to bruises, contusions, &c., as a valuable resolutive agent, capable of fulfilling all the objects for which ordinary refrigerants are used.

IV. REVIEWS AND NOTICES OF BOOKS.

PRACTICAL DIRECTIONS FOR THE PREPARATION OF AERATED WATERS, *and the various compounds of Carbonic Acid Gas, by Bakewell's Patent Apparatus: with Observations upon the Pharmaceutical and Therapeutical Agencies, and their Efficacy in the Cure of some of the most important Diseases of the Human Body, viz: Indigestion, Phthysis, Nervous atony, or Mental Depression, Diseases of the Genito Urinary Organs, &c., with Cases of Illustration.* By Robert Venables, A.M., M.B., Incep. Candidate, Royal College of Physicians, London.

In our May number we furnished our readers with a description of the portable apparatus for the production of aërated waters, and we then expressed our conviction that this apparatus would come into general use among pharmaceutical chemists; for the purpose of associating medicines with carbonic acid; this we find to be actually the case, for many druggists are providing themselves with it.

The little work before us is a most excellent practical guide to the association of carbonic acid with other medicines, and to the general pharmaceutical and therapeutical application of this acid.

The book is well written, and is fully explanatory; and much care and labor have been bestowed on it.

It appears that Dr. Venables has used the aërated medicine, prepared by Bakewell's apparatus, in his private practice, and that his opportunities of testing its efficacy have been extensive.

We subjoin an extract:—

PHARMACEUTICAL AGENCIES.

Having considered carbonic acid both in its free and combined states, the next subject for consideration is the pharmaceutical purposes which it is calculated to effect. It is a general principle in chemistry that bodies do not act on each other unless one or both be in solution, or at least that water in some form be present. Although there are some exceptions to this rule—for example, some of the metals with chlorine, iodine, bromine, &c., where mere contact is sufficient to the development of chemical action and combination, yet in a great proportion of instances it will be found that compound bodies do not react upon each other, unless one at least be in solution or that water in some form be present. For example: dry carbonate of soda, and the citric or tartaric acid, do not act upon each though mixed together; but if water, especially hot, be poured upon the mixture, a most energetic action is excited, and violent effervescence assures us that the stronger acid is rapidly disengaging the carbonic. In like manner if dry sulphate of iron and carbonate of soda be mixed their principles remain quiescent; but if water be added, reaction immediately commences, and there is a complete interchange of principles, to such an extent that one of the salts at least shall be completely changed.

The above principles, in fact, may be said to extend to therapeutical pharmacy; which may be defined the art of preparing medicinal agents so as to exalt their virtues and increase their powers. With but very few exceptions, remedies are found to be more energetic, and much more in proportion as they are rendered more soluble. Hence we combine morphia, the active principle of opium, with hydrochloric acid, or with the acetic, and in the latter case we prefer the acetic acid in excess; because pure morphia is very insoluble, and, therefore, would prove neither so instantaneous nor energetic in its effects. But by combining with hydrochloric acid, hydrochlorate of morphia is formed, a salt of considerable solubility, and which, therefore, acts speedily and powerfully. The compound with acetic acid still more clearly illustrates these principles. The acetate of morphia, by keeping, parts with a proportion of its acid, becoming di-acetate, a salt comparatively very insoluble, and in proportion slow and inert in its action; but when acetic acid is added, an acetate, dissolved still more effectually by an excess of acid, proportionally rapid and energetic in its action, is formed.

From the principles above established, we may collect that the chemical agencies of carbonic acid may be rendered extensively subservient to therapeutical pharmacy, from its capabilities of rendering some of our most powerful and active medicines soluble, and thus placing them in the circumstances most calculated to increase their energies, and insure their therapeutical agencies to the fullest extent, and in the highest degree. It has been shown, that, although some of the neutral compounds of carbonic acid, the carbonated alkaline earths for instance, are wholly insoluble in water, yet water, impregnated with carbonic acid will now prove a solvent. However, in reference to the earthy carbonates, we seldom, if ever, have occasion to avail ourselves (pharmaceutically) of the solvent powers of this gas. Chalk being a general remedy for diarrhœa is probably more effectual in its natural state of insolubility than when held in solution by an excess of the gas. As an antacid, also, most practitioners prefer the chalk as an insoluble compound to the same held in solution by an excess of carbonic acid.

The facts, however, in respect to the alkalis, are widely different; as antacids, the more caustic the alkalis the greater their saturating powers; but in this caustic state the more energetic their chemical action on the tissue, and, consequently, the more active they prove in impairing the digestive funtions. A given quantity of carbonated alkali, no matter how great the quantity of carbonic acid, will always exert the same saturating or neutralising power as the corresponding quantity of caustic or uncombined alkali; but in the former case, the development of the antacid reagencies will not exert any chemically injurious reagencies upon the gastric tissues; but in the caustic condition, although the ultimate effect will be the same, the local action upon the tissue will be much more destructive, and by the reaction upon the economy will, to a proportionate extent, prove generally injurious. Hence the carbonated alkalis are preferred for internal administration. But the bicarbonates, the mildest forms, are much less soluble; this inconvenience however may be remedied by using, as the solvent, water highly charged with carbonic acid. The bicarbonates insoluble in a proportion of pure water are speedily dissolved by the same water strongly impregnated with carbonic acid gas. Hence we can readily comprehend how carbonic acid may be made a valuable pharmaceutical agent, in respect to the caustic alkalis.

With respect to the earths, magnesia is the only one requiring any observation. This earth, owing to its very inferior causticity, while, at the same time, it neutralises acidity, has been occasionally preferred to the alkalis. Magnesia, however, is very bulky, or, in other words, a given degree of saturating power cannot be attained without an excessively bulky dose. Magnesia, too, both in its caustic and carbonated state, acts very slowly, and a considerable time elapses before the combination takes place. Another, and a very great inconvenience arises from the habitual use of ordinary magnesia, namely, that it is apt to concrete, or aggregate with the mucus of the intestinal tube into masses of considerable size. Hence, frequently obstinate costiveness, and even inflammation of the bowels, from the prolonged and inconsiderate use of magnesia. By dissolving the magnesia, by means of carbonic acid, these effects may be entirely prevented; and as the saturating powers of magnesia nearly equal those of ammonia, this mode of administration will prove a valuable means of securing its effects. This dose of carbonate of magnesia placed in the receiving flask, and the aërated water drawn upon it, will be dissolved, and is most advantageously administered in this way.

In the administration of iron as chalybeate, tonic, astringent, emmenagogue, or, indeed, for any other purpose, we shall find carbonic acid presenting us with the means of not only exalting the virtues, but of greatly increasing the powers of the remedy. It must be kept in view that the proto-salts of iron are the most *powerful* therapeutical agents, while they are comparatively wholly devoid of all *irritating* agencies, but the very reverse holds good with respect to the per or sesqui-salts of the same mineral. The *protocarbonate* of iron is unquestionably the very best chalybeate; hence the reputation of "Griffiths' Mixture," which owes its virtues to the extemporaneous formation of protocarbonate of iron. To prove of use it should be administered the moment it has been prepared. Its virtues seem to depend upon—1st, the iron being in the form of *protoxide;* 2nd, the protoxide being united or salified by the *carbonic* acid; 3rd, according to Dr. Paris, the *protocarbonate* of iron is held partly in solution, by an excess of alkali. All these advantages may be obtained by dissolving iron in water by means of excess of carbonic acid; and we shall have this farther advantage, that we can in this way give the chalybeate pure and uncontaminated when this is desirable, or in conjunction with other principles when such is the object.

LITERARY ANNOUNCEMENT.

We perceive from an advertisement on the cover of The Chemist that Mr. James S. Muspratt is about to publish a translation of Plattner On the Blowpipe, which we expect will be executed in a manner worthy of the original author and the translator.

TO CORRESPONDENTS.

Want of space compels us to answer most of our correspondents by post. Those who do not receive replies will favor us by sending their names and addresses.

To suit the convenience of such of our readers as may wish for answers to questions sooner than can be obtained through the "Notices" in our Journal, we have determined on the following. Letters sent *before* the 10th of each month will be answered on that day by private letter; those which are sent after that time, on the 20th; after the 20th, letters will be answered in the Monthly Number, or privately, on the 1st. Correspondents must send their names and addresses; or initials, and the post-offices of their districts, will do.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN JULY, 1843.

BY E. THOMPSON.

BAROMETER.

Monthly mean . . .	29·76
Mean at 9 a.m. . .	29·79
Mean at 3 p.m. . .	29·75
Mean at 9 p.m. . .	29·76
Maximum on 11th .	30·16
Minimum on 29th . .	29·33
Range	0·83

THERMOMETER.

Monthly Mean . . .	55°
Mean of Maxima . .	65
Minima	46
Maximum on 12th . .	75
Minimum on 24th . .	46
Range	29

WIND.

	Days.		Days.
N.	1	S.	0
N. E.	12	S. W.	2
E.	3	W.	16
S. E.	1	N. W.	7

RAIN.

3·53 inches.

WEATHER.

	Days.		Days.
Clear . . .	5	Continued rain .	2
Cloudy . . .	4	Mist	0
Overcast . .	2	Lightning . . .	2
Shower . .	17	Thunder . . .	3

GENERAL REMARKS.

During this period much rain has again fallen. The mean temperature has been 55°, whilst the average for July in the latitude of London is 62°. Thus, making allowance for our more northerly and elevated situation, this month has been cold.

From the 5th to the 9th a thunder-storm occurred, which was also experienced, in the midland and southern counties, in Scotland, and in Belgium.

Nota Bene.—*All Communications, Books for Review, and Substances to be analysed, must be addressed "To the Editors of The Chemist,* 310, *Strand, London." Communications must be pre-paid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

EXPERIMENTS ON THE FORMATION OF THE SALTS OF SULPHUROUS ACID, WITH THEIR ANALYSES*.

BY JAMES SHERIDAN MUSPRATT, OF SEAFORTH HALL, LIVERPOOL.

At the suggestion of Professor Liebig, I undertook the investigation of the salts of sulphurous acid, in order to ascertain whether their constitution and crystalline form were analogous to those of the salts of carbonic acid.

Sulphurous acid, which is one of the feeblest, is expelled from its combinations by almost all acids but the carbonic. It is very easily converted into sulphuric acid by absorbing oxygen from many bodies; thus, when it is conducted through solutions of of mercury or gold, these metals are reduced to the metallic state.

The composition and equivalent of sulphurous acid are as follows:—

Sulphur	50·156	one equivalent	16·12
Oxygen	49·844	two equivalents	16·02
	100·000		32·14

Having given a brief sketch of the properties, &c., of this acid, I shall at once state my results as far as I have proceeded.

FIRST EXPERIMENT.

I passed sulphurous acid gas through a dilute solution of perfectly pure carbonate of potassa, until all the carbonic acid was eliminated, and then placed the liquid under a bell jar to crystallize. Four days afterwards, I obtained large crystals, in the form of an oblique octohedron, and of the following composition:—

Sulphurous acid	32·91	one atom.
Potassa	48·57	one atom.
Water	18·44	two atoms.
Loss	8	
	100·00	

Formula, $KO, SO^2 + 2 HO$. The salt thus produced is isomorphous with the carbonate of potassa, the formula of which is $KO, CO^2 + 2 HO$.

SECOND EXPERIMENT.

I passed a stream of sulphurous acid gas through a concentrated solution of carbonate of potassa until effervescence ceased, and the liquid assumed a yellowish green color. In a short time, small granular crystals were deposited, which, according to three carefully conducted analyses, gave:—

	1st analysis.	2nd analysis.	3rd analysis.
Sulphurous acid	57·411	57·573	57·589
Potassa	41·000	41·992	42·277
Loss	1·589	·535	·244
	100·000	100·000	100·000

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* Communicated by the Author.

The constitution of the above salt is very singular, as it contains two atoms of sulphurous acid united with one atom of potassa, *and no water* (as was ascertained by heating the salt with oxide of copper, and also with chromate of lead). This salt has never been noticed, and is not analogous in constitution to any compound yet known, except the bichromate of potassa. I subjoin the formulæ of the two salts.

$$KO,\ SO^2 + SO^2$$
$$KO,\ CrO^3 + CrO^3$$

This new sulphite, on being slightly heated, gives off sulphurous acid; but if the heat be increased, sulphur also is liberated, which sublimes in the upper part of the tube, and, on testing the residue, I ascertained that it was only neutral sulphate of potassa; therefore, by the following equation, the decomposition will be at once perceived :—

$$2\ (KO,\ 2\ SO^2) \text{ resolved into } SO^2,\ S \text{ and } 2\ (KO,\ SO^3).$$

Professor Graham is of opinion that this salt will be a valuable addition to his new theory on the constitution of various compounds, and it will probably induce Professor Liebig to double the equivalent of sulphurous acid, making it $S^2\ O^4$, instead of SO^2.

I have formed other acid salts of potassa, but owing to their parting with sulphurous acid at the ordinary temperature of the atmosphere, I did not obtain satisfactory analyses of them.

THIRD EXPERIMENT.

I passed sulphurous acid through a weak solution of carbonate of soda, and obtained, in large crystals, a salt containing one atom of sulphurous acid, one atom of potassa, and ten atoms of water.

ANALYSIS.

Sulphurous acid	20·81
Soda	20·18
Water	58·70
Loss	·31
	100·00

The corresponding carbonate is $NaO,\ CO^2 + 10\ HO$.

FOURTH EXPERIMENT.

I passed the gas through a concentrated solution of carbonate of soda and obtained a salt, in opaque crystals, containing two atoms of sulphurous acid, one atom of potassa, and one atom of water. According to Graham it is a sulphite of potassa with sulphite of water.

Formula of this bisulphite .... $KO,\ SO^2 + HO,\ SO^2$
Formula of the corresponding carbonate ...... $KO,\ CO^2 + HO,\ CO^2$

This salt very readily abandons its second atom of sulphurous acid.

FIFTH EXPERIMENT.

I passed a stream of sulphurous acid through water in which carbonate of magnesia was suspended; by great care, and by excluding atmospheric air, I obtained prismatic rhomboïdal crystals of the following composition :—

Sulphurous acid	39·22	one equivalent.
Magnesia	25·90	one equivalent.
Water	34·81	three equivalents.
Loss	7	
	100·00	

Formula—$MgO,\ SO^2 + 3HO$, corresponding with the carbonate—$MgO,\ CO^2 + 3\ HO$.

SIXTH EXPERIMENT.

I formed a crystalline salt with sulphurous acid and ammonia by evaporation under the air pump; but owing to its being such an unstable compound, I have not as yet devised an accurate method of investigating its nature.

SEVENTH EXPERIMENT.

I passed sulphurous acid through water in which hydrated peroxide of iron ($Fe^2\ O^3,\ HO$) was suspended; in this process a sulphite and a sulphate of the protoxide of iron were formed :—

$$2\ (Fe^2\ O^3) + 4\ SO^2 \text{ changed into } 2\ (Fe\ O,\ SO^2) + 2\ (Fe\ O,\ SO^3).$$

The sulphite of iron precipitates from the solution when absolute alcohol is added, but the compound being almost as readily decomposed as the carbonate of iron, it is difficult to analyse it.

EIGHTH EXPERIMENT.

Alumina only in the state of a hydrate, like peroxide of iron, dissolves in sulphurous acid, and the sulphite formed I found was precipitated as a white amorphous powder when the liquid was boiled, but when the solution became cool the sulphite disappeared. Formula—$Al^2O^3+3SO^2$.

NINTH EXPERIMENT.

I passed sulphurous acid through water containing the oxide of chromium (Cr^2O^3); the compound resulting readily dissolved, and on being heated with alcohol, deposited the sulphite of chromium of a whitish color.

TENTH EXPERIMENT.

I passed the gas through carbonate of manganese suspended in water. The sulphite of manganese, which is white, I did not obtain in a crystallised state. When the sulphurous acid is conducted through water containing peroxide of manganese in a state of suspension, hyposulphate of manganese is formed—$MnO^2+2SO^2=MnO,S^2O^5$.

In this process, the liquid must be surrounded with ice to prevent an elevation of temperature. This salt was first formed by Gay-Lussac.

ELEVENTH EXPERIMENT.

When sulphate of copper is boiled with a weak solution of sulphite of soda, or when sulphurous acid gas is passed through water containing carbonate of copper in a state of suspension, a beautiful ruby-colored salt is deposited, the form of the crystals being an oblique rhombic prism. The two decompositions may be represented by the following equations:—

I. $2\,(Cu\,O, SO^3) + 3\,(KO, SO^2)$ giving $(Cu^2\,O, SO^2)$ and $3\,(KO, SO^3) + SO^2$
II. $3\,(Cu\,O, CO^2, Cu\,O, HO) + 4\,SO^2$ giving $2\,(Cu^2O, SO^2)$ and $2\,(Cu\,O, SO^3) + 3\,CO_2$

ANALYSIS OF THIS SALT.

Suboxide of copper	63·34
Sulphurous acid	28·52
Water	8·11
Loss	·03
	100·00

When this salt is boiled with water, it is resolved into sulphate of copper ($Cu\,O, SO^3$), sulphuret of copper ($Cu\,S$), suboxide of copper ($Cu^2\,O$), and sulphurous acid.

This salt forms a double compound with the sulphite of potassa, the formula of which is $Cu^2\,O, SO^2+2\,(KO, SO^2)$.

The subsulphite of copper corresponds, both in crystalline form and constitution, with the blue carbonate of copper (azure copper ore), the composition of which, according to Klaproth, is:—

Deutoxide of copper (Cu^2 O)	70·0
Carbonic acid	24·0
Water	6·0
	100·0

TWELFTH EXPERIMENT.

The sulphite of lime, obtained by double decomposition, was dissolved in sulphurous acid, and crystals containing two atoms of water were obtained. Formula—$CaO, SO^2+2\,HO$. I found this salt to be the most persistent compound of sulphurous acid.

THIRTEENTH EXPERIMENT.

I dissolved the sulphite of baryta in sulphurous acid, and obtained needle crystals, which gave by analysis:—

Sulphurous acid	28·81
Baryta	70·01
Water	1·44
	100·26

The water in these crystals was only mechanically contained between the layers.

FOURTEENTH EXPERIMENT.

I passed sulphurous acid through the oxide of lead suspended in water, and obtained a compound, which, when heated, evolved sulphurous acid, and the residue consisted of sulphate and sulphuret of lead.

The sulphurous acid used for the preceding experiments I obtained by decomposing sulphuric acid by means of metallic copper. The metal combines with one atom of the oxygen of the sulphuric acid, and the sulphur, with the remaining two atoms of oxygen, passes off as sulphurous acid gas; the oxide formed unites with the remaining sulphuric acid, forming sulphate of copper—$Cu+2\,SO^2 = Cu\,O, SO^3+SO^2$.

On my return to Giessen I shall finish this interesting subject, and send the conclusions arrived at relative to the isomorphism, &c., of the sulphites and carbonates for publication in this journal.

Chemical Laboratory, Giessen.

[We are glad again to receive a communication from one of our earliest and most talented correspondents; and we hope that we shall frequently have the pleasure of hearing from him. Mr. Muspratt has studied chemistry under professors Graham and Liebig, and with so much success as to render him a credit to his teachers. We wish that our eminent manufacturers would more generally follow his example, and devote themselves to the acquisition of that science on which their operations are based, and without a knowledge of which they must be working in the dark.]

THE EFFECT OF COLORED DEVICES OF CHINA WARE ON THE CRASSAMENTUM OF THE BLOOD.*

BY PATRICK J. MURPHY, M.D., OF LIVERPOOL.

If blood be drawn into a cup having a colored figure at the bottom, the impression is sometimes transferred to that part of the crassamentum with which it is in contact. This fact was first communicated to me by Mr. Taylor, of Nile-street, an intelligent surgeon of this town, who referred me for further information to a paper published by Dr. Newbiggin, of Edinburgh, in the *Edinburgh New Philosophical Journal*, vol. 27., April to October, 1839; and also to one of his own in *The Lancet* of Feb. 29, 1840. Dr. Newbiggin—finding that when the color on the cups is raised, i.e., thickly painted, the figures on the blood are most vivid; but that when the color had been transferred to the biscuit ware from paper, as in printing, they were scarcely discernible—naturally infers that the effect was solely mechanical; but subsequent experiments induced him to abandon this explanation.

Mr. Taylor, on the other hand, believes the phenomenon to be purely chemical, and in corroboration read a paper before the Liverpool Medical Society, at the same time demonstrating the fact by exhibiting the impression on the crassamentum; but although it excited much curiosity and discussion, it produced no inquiry to elucidate the cause.

Not being satisfied with Mr. Taylor's theory, notwithstanding its ingenuity, I requested my young friend, Mr. Jas. Sheridan Muspratt, during the recess of the Giessen School of Chemistry, to afford me his assistance towards a solution of the difficulty, which was cheerfully given.

A course of experiments was commenced, at most of which Mr. Taylor and the senior editor of this journal were present. As this fact, as well as the remarks of Dr. Newbiggin and Mr. Taylor, are probably unknown to most of your readers, their experiments as well as our own are here all intermingled, my object being merely to obtain an explanation of the phenomenon. It is indisputable that the impression is owing to some law of Mechanics, Chemistry, or Optics. On inverting the cup which contains the blood, it is almost unnecessary to say that the base of the crssamentum is of a dark color. The figure is not at first perceptible, but after a few minutes' exposure to light and air, it assumes gradually and distinctly a vivid red color, plainly discernible on the dark ground. A few hours sometimes suffice to remove it; but in one case of a star figure, colored by oxide of chrome, it was unchanged at the end of forty-eight hours. Our first attempts were to ascertain whether this effect was mechanical.

(To be continued.)

ON ASSAYING THE ORES OF IRON.*

BY LEWIS THOMPSON, ROYAL POLYTECHNIC INSTITUTION.

Although but little difficulty exists in determining the proportion of iron contained in any of the ores of that metal, yet an easy and certain means of making a practical assay is still unknown to the manufacturer. The wet assay is clearly useless, since it indicates merely the quantity of iron existing in the mineral, without pointing out how much can be extracted from it, and would lead us to conclude that the pyritic were more valuable than the argillaceous ores of iron. The plan recommended by Mr. Mushet is, therefore, generally preferred, but the difficulty and uncertainty attendant on all crucible operations conducted at so high a temperature, together with the differences observed in the weight and composition of the metal thus obtained, even when the same ore, flux, and furnace, have been employed, render the result at best but an approximation, and quite unworthy of the name of an assay. The following method requires no more skill in manipulation than any workman might acquire in two hours: its indications are delicate, and may easily be observed to the $\frac{1}{50}$ of a grain, and its simplicity almost precludes the possibility of error. The apparatus required may be obtained or made in any part of this country, and is as follows:—a small crucible furnace, a portion of an old gun barrel, a few earthenware trays capable of being passed through the gun barrel, a small bottle of sulphuric acid, a small pneumatic trough, tubulated bottle and jar,—the latter being graduated into cubic inches and tenths, and capable of containing about a quart. The operation is conducted as follows:—Charge the furnace in the usual manner with red hot charcoal, then pass the gun barrel in a horizontal direction through the holes in the side of the furnace, and having weighed out 50 or 100 grains of the powdered ore, introduce this into one of the trays, which must be pushed along the gun barrel into the hottest part; then pass a current of common coal gas slowly through the tube for fifteen minutes, and raise the temperature to a bright cherry red or white heat; after which, gradually withdraw the tray to the cooler part of the tube, and when its contents are sufficiently cooled to appear black, turn off the current of coal gas, allow the tray to become nearly cold, then place the dark grey mass which it contains in the pneumatic flask, and pour upon it about an ounce of diluted sulphuric acid, and, quickly adapting the tube, collect the gas produced in the graduated jar over water contained in the pneumatic trough; when the gas has ceased to come over, bring the water in the jar to a level with that in the trough, and read off the number of cubic inches and tenths;—every 47 cubic inches of gas indicate 28 grains of metallic iron, and so on proportionally. A little solution of potassa or soda may be added to the water in the trough, for the purpose of absorbing any sulphuretted hydrogen or carbonic acid which might exist in the gas generated; but I have never found carbonic acid in it; for the carbonates of lime and baryta are rendered caustic during the process, and the quantity of sulphuretted hydrogen is exceedingly small. When coal gas cannot be obtained, hydrogen may be employed instead. There is no danger of any oxide or metallic iron falling from the gun barrel into the tray; and a long experience has convinced me that an iron tube is in this respect quite equal to one made of earthenware, which may, however, be employed by those who deem it necessary to have not only security, but also the appearance of it.

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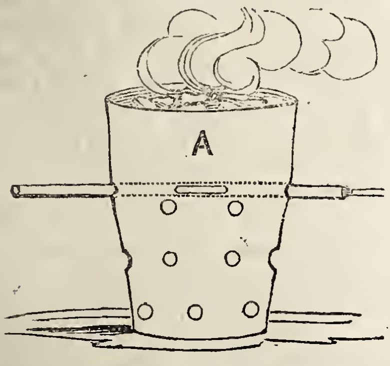
* Communicated to The Chemist by the Author.

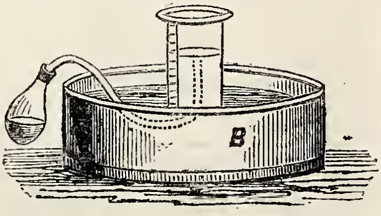
* Communicated to The Chemist.

An explanation of this simple process seems uncalled for, the only object in view being to reduce the oxide of iron contained in the ore at such a temperature as will prevent the metal from inflaming spontaneously when exposed to the air. For this purpose a high heat must be used. The iron is then to be dissolved in a dilute acid, and its quantity inferred from the proportion of hydrogen given off during the oxidation of the metal by the water. The atmospheric air expelled in the first instance from the flask into the jar, is, of course, a correct measure of the hydrogen remaining in the flask, and from the minutely divided state of the metal, heat is unnecessary to favor its salution in the acid. Manganese, if present in the ore, is not reduced.

The following sketch will perhaps illustrate the subject:—



A—Crucible furnace, tray, and gun barrel, with the connecting pipe for coal gas, to reduce the iron to the metallic state.



B—Pneumatic flask, jar, and trough, for collecting and measuring the hydrogen gas.

AN EFFORT TO REFUTE THE ARGUMENTS ADVANCED IN FAVOR OF THE EXISTENCE, IN THE AMPHIDE SALTS,* OF RADICALS CONSISTING, LIKE CYANOGEN, OF MORE THAN ONE ELEMENT.†

BY ROBERT BARE, M.D., PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF PENNSYLVANIA.

The following is a Summary of the Opinions which it is the Object of the Subsequent Reasoning to Justify.

(*a*) The community of effect, as respects the extrication of hydrogen by contact of certain metals with aqueous solutions of sulphuric and chlorohydric acids, is not an adequate ground for an inferred analogy of composition, since it must inevitably arise that any radical will, from any compound, displace any other radical, when the forces favoring its substitution preponderate over the quiescent affinities.

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* An amphide salt is one consisting of an acid and a base, each containing an amphigen body, either oxygen, sulphur, selenium, or tellurium, as its electro-negative ingredient.

† Communicated to THE CHEMIST by the Author.

(*b*) But if, nevertheless, it be held that the evolution of hydrogen from any combination, by contact with a metal, is a sufficient proof of the existence of a halogen* body, simple or compound, in the combination, the evolution of hydrogen from water, by the contact with any metal of the alkalis, must prove oxygen to be a halogen body; also the evolution of hydrogen from sulphydric, selenhydric, or telluhydric acids, by similar means, would justify an inference that sulphur, selenium, or tellurium, as well as oxygen, belong to the halogen or salt radical class:—

(*c*) The amphigen bodies being thus proved to belong to the halogen class, oxides, sulphides, selenides, and tellurides, would be haloïd salts, and their compounds double salts, instead of consisting of a compound radical and a metal:—

(*d*) The argument in favor of similarity of composition in the haloïd and amphide salts, founded on a limited resemblance of properties in some instances, is more than counterbalanced by the extreme dissimilitude in many others:—

(*e*) As, in either class, almost every property may be found which is observed in any chemical compound, the existence of a similitude, in some cases, might be naturally expected:—

(*f*) As it is evident that many salts, perfectly analogous in composition, are extremely dissimilar in properties, it is not reasonable to consider resemblance in properties, as a proof of analogy in composition:—

(*g*) No line of distinction, as respects either properties or composition, can be drawn between the binary compounds of the amphigen and halogen bodies, which justifies that separate classification which the doctrine requires; so that it must be untenable as respects the one, or be extended to the other:—

(*h*) The great diversity, both as respects properties and composition of the bodies called salts, rendering it impossible to define the meaning of the word, any attempt to vary the language and theory of chemistry, in reference to the idea of a salt, must be extremely pernicious:—

(*i*) There is at least as much mystery in the fact, that the addition of an atom of oxygen to an oxacid, should confer an affinity for a simple radical, as that the addition of an atom of this element to such a radical, should create an affinity between it and an oxacid:—

(*j*) If one atom of oxygen confer upon the base into which it enters, the power to combine with one atom of acid, it is quite consistent that the affinity should be augmented, proportionally, by a further accession of oxygen:—

(*k*) It were quite as anomalous, mysterious, and improbable, that there should be three oxyphosphions, severally requiring for saturation one, two, and three atoms of hydrogen, as that three isomeric states of phosphoric acid should exist, requiring as many different equivalents of basic water:—

(*l*) The attributes of acidity alleged to be due altogether to the presence of basic water, are not seen in hydrated acids, when holding water in that form only; nor in such as are, like the oily acids, incapable of uniting with water as a solvent. Further these attributes are admitted to belong to salts which, not holding water as a base, cannot be hydrurets or hydracids of any salt radical: and while such attributes are found in compounds which, like chromic, or carbonic acid, cannot be considered as hydrurets, they do not exist in all that merit this appellation, as is evident in cases of prussic acid, or oil of bitter almonds:—

(*m*) It seems to have escaped attention, that if SO^4 be the oxysulphion of sulphates, SO^3, anhydrous sulphuric acid, must be the oxysulphion of the sulphites; and that there must in the hyposulphites and hyposulphates be two other oxysulphions:—

(*n*) The electrolytic experiments of Daniell have been erroneously interpreted, since the electrolysis of the base of sulphate of soda would so cause the separation of sodium and oxygen, that the oxygen would be attracted to the anode, the hydrogen and soda being *indirectly* evolved by the reaction of sodium with water; while the acid, deprived of its alkaline base, would be found at the anode in combination with basic water, without having been made to act in the capacity of an anion.

(*o*) The copper in the case of a solution of the sulphate of this metal and a solution of potassa, separated by a membrane, would, by electrolyzation, be evolved by the same process as sodium, so long as there should no longer be any copper to act in this capacity, the metal of the alkali, or hydrogen, of water, on the other side of the membrane, would act as a cathion; the oxygen acting as an anion from one electrode to the other, first to the copper, and then to the potassium:—

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* The epithet *halogen* is applied to bodies whose binary compounds with metals are deemed salts, and which are consequently called haloïd salts.

(*p*) The allegation that the copper was deposited from the want of an anion (oxysulphion) to combine with, is manifestly an error, since, had there been no anion, there could have been no discharge, as alleged, to hydrogen as a cathion, nor any electrolysis:—

(*q*) The hydrated oxide precipitated on the membrane came from the reaction of the alkali with the sulphate of copper; the precipitated oxide of this metal from oxygen of the soda acting as an anion; and the deposit of metallic copper from the solutions performing, feebly, the part of electrodes, while themselves the subjects of electrolyzation:—

(*r*) The so-called principles of Liebig,* by which his theory of organic acids is preceded, are mainly an inversion of the truth, since they make the capacity of saturation of hydrated acids dependent on the quantity of hydrogen in basic water, instead of making both the quantity of water, and, of course, the quantity of hydrogen therein, depend on their capacity:—

(*s*) All that is truly said of hydrogen would be equally true of any other radical, while the language employed would lead the student to suppose that there is a peculiar association between capacity of saturation, and presence of hydrogen.

I. Some of the most distinguished European chemists, encouraged by the number of instances in which the existence of hypothetical radicals has been rendered probable, have lately inferred the existence of a large number of such radicals in a most important class of bodies heretofore considered as compounds of acids and bases. It has been inferred, for instance, that sulphur, with four atoms of oxygen (SO^4) constitutes a compound radical, which performs in hydrous sulphuric acid, the same part as chlorine in chlorohydric acid.

II. Graham has proposed sulphatoxygen as a name for this radical, and sulphatoxide for any of its compounds. Daniell has proposed oxysulphion and oxysulphionide for the same purposes. I have given the preference to a nomenclature moulded upon the last-mentioned plan. In reasoning on the subject I shall use this nomenclature, not, however, with a view to sanction it, as I disapprove altogether of this innovation, and deny the sufficiency of the grounds upon which it has been justified. Consistently with the language suggested by Daniell, hydrous sulphuric acid, constituted of one atom of acid and one of basic water (SO^3+HO), is a compound of oxysulphion and hydrogen (SO^4+H). Nitric acid (NO^5+HO) is a compound of oxynitrion and hydrogen (NO^6+H). In like manner we should have oxyphosphion in phosphoric acid, oxyarsenion in arsenic acid, and in all acids, hitherto called hydrated, whether organic or inorganic, we should have radicals designated by names made after the same plan. Their salts having corresponding appellations, would be oxysulphionides, oxynitrionides, &c. Also, in any salt in which any other of the amphigen class of Berzelius is the electro-negative ingredient, whether sulphur, selenium, or tellurium, all the ingredients excepting the electro-positive radical, would be considered as constituting a compound electro-negative radical.*

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* *Traité de Chimie Organique*, tom. 1, page 7.

* The conception of the existence of salt radicals seems to have originated with Davy. It was suggested by Berzelius, in his letter in reply to some strictures which I published on his Nomenclature, in the following language:—

"If, for instance, the true electro-chemical composition of the sulphate of potassa should not be $KO+SO^3$, as is generally supposed, but $K+SO^4$, and it appears very natural that atoms, so eminently electro-negative as sulphur and oxygen, should be associated, we have, in the salt in question, potassium combined with a compound body, which, like cyanogen in $K+C^2N$, imitates simple halogen bodies, and gives a salt with potassium and other metals. The hydrated oxacids, agreeably to this view, would be then hydracids of a compound halogen body, from which metals may displace hydrogen, as in the hydracids of simple halogen bodies. Thus we know that SO^3, that is to say, anhydrous sulphuric acid is a body, whose properties, as respects acidity, differ from those which we should expect in the active principle of hydrous sulphuric acid.

"The difference between the oxysalts and the halosalts is very easily illustrated by formulæ. In KFF (fluoride of potassium), there is but one single line of substitution, that is to say, that of K | FF; whilst in KOOOOS (sulphate of potassa) there are two, K | OOOOS and KO | OOOS, of which we use the first in replacing one metal by another, for instance, copper by iron and the second, in replacing one oxide by another.

"I do not know what value you may at-

III. It may be expedient to take this opportunity of mentioning that the advocates of this new view, disadvantageously, as I think, employ the word radical to designate the electro-negative as well as the electro-positive ingredient agreeably to the nothe nomenclature of Berzelius, the former would be a compound halogen body. Cyanogen being analogous, is by him placed in the halogen class; I shall, therefore, in speaking of "*salt radicals*," improperly so called, employ the appellation contrived by the great Swedish chemist.

IV. It seems, however, to be conceded, that however plausible may be the reasons for inferring the existence of halogen bodies in the amphide salts, it would be inexpedient to make a corresponding change in nomenclature, on account of the great inconvenience which must arise from the consequent change of names.

V. Under these circumstances, it may be well to consider how far there is any necessity for adopting hypothetical views, to which it would be so disadvantageous to accommodate the received language of chemists. In the strictures on the Berzelian nomenclature, which drew from Berzelius the suggestions contained in the quotation at the foot of the preceding page, I stated it to be my impression that water should be considered as acting in some cases as an oxybase, in others as an oxacid; and, in my examination of his reply,* *I observed that hydrous sulphuric acid might be considered as a sulphate of hydrogen, and that when this acid reacts with zinc and iron, the proneness of hydrogen to the aëriform state enables either metal to take its place, agreeably to the established laws of affinity.*

VI. There appears to have been a coincidence of opinion between Kane, Graham, Gregory, and myself, as respects the electro-positive relation of hydrogen to the amphigen and halogen elements, which I have designated collectively as the basacigen class; also in the impression that hydrogen acts like a metallic radical, its oxide, water, performing the part of a base. I agree perfectly with Gregory in considering that hydrated acids may be considered as "*hydrogen salts.*" But when the learned editor proceeds to allege that "*acids and salts, as respects their constitution,* will form one class," I consider him, and those who sanction this allegation, as founding an error upon an oversight. Because the salts of hydrogen, or such as have water for their base, have heretofore been erroneously called acids, we are henceforth to confound salts with acids, and, instead of correcting one wrong name, cause all others to conform thereto.

VII. I fully concur with Gregory and Kane, in considering that water, in hydrous sulphuric acid, nitric acid, chloric acid, and in organic acids, generally acts as a base; also, that in this basic water hydrogen performs a part perfectly analogous to that of a metallic radical; but, agreeably to this view, I cannot perceive any difficulty in accounting for the evolution of hydrogen suggested in the quotation above made (VII.) agreeably to which when diluted sulphuric acid reacts with zinc or iron, the liberation of hydrogen results from the superiority of the forces which tend to insert either of these metals in the place occupied by the hydrogen, over those which tend to retain it *in statu quo*.

VIII. When oxide of copper is presented to chlorohydric acid, it is inferred that the hydrogen unites with oxygen, and the chlorine with the metal; and hence it seems to be presumed, that when oxide of copper is combined with sulphuric acid, a similar play of affinities should ensue; but would it be reasonable to make this a ground for assuming the existence of a compound radical, when the phenomena admit of another explanation quite as simple and consistent with the laws of chemical affinity?

IX. Whether hydrogen be replaced by zinc, or oxide of hydrogen by oxide of copper, cannot make any material difference. In the one case a radical expels another radical, and takes its place; in the other, a base expels another base, and takes its place.

X. There can be no difficulty, then, in understanding wherefore, from the compound of sulphur, and three atoms of oxygen, and an atom of basic water, hydrogen should be expelled and replaced by zinc, or that water should be expelled and replaced by oxide of copper; the only mystery is in the fact, that SO^3, as anhydrous sulphuric acid, will not combine with hydrogen, copper, or any other radical, unless oxidized. But this mystery equally exists on assuming that an additional atom of oxygen converts SO^3 into oxysulphion, endowed with an energetic affinity for metalic radicals, to which SO^3 is quite indifferent.

XI. In either case an inexplicable mystery exists; but it is, in the one case, associated with an hypothetical change, in the

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tach to this development of the constitution of the oxysalts (which applies equally to the subphosalts and others); but as to myself, I have a thorough conviction that there is therein something more than a vague speculation, since it unfolds to us an internal analogy in phenomena, which, agreeably to the perception of our senses, are extremely analogous."

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* *Silliman's Journal*, Vol. 27, for 1835, page 61.

other, with one which is known to take place.

XII. But if hydrous sulphuric acid is to be assumed to be a hydruret of a compound halogen body (*oxysulphion*), because it evolves hydrogen in contact with zinc, wherefore is not water which evolves hydrogen on contact with potassium, sodium, barium, strontium, or calcium, to be considered as a hydruret of oxygen, making oxygen a halogen body?

XIII. Boldly begging the question, Graham reasons thus:—"*The chlorides themselves being salts, their compounds must be double salts.*"

XIV. But if the chlorides are salts, the chloride of hydrogen is a salt; and if so, wherefore is not the oxide of hydrogen a salt, which in its susceptibility of the crystalline form, has a salt attribute which the aëriform chloride does not possess?

XV. Further, if the oxide of hydrogen be a salt, every oxide is a salt as well as every chloride. Now, controverting the argument above quoted by analogous reasoning, it may be said, "*the oxides themselves being salts, their compounds are double salts.*" Of course, sulphate of potassa is not a sulphate-oxide as Graham's ingenious nomenclature would make it, but must be a double salt, since it consists of two oxides in "themselves salts."

XVI. I trust that sufficient reasons have been adduced, to make it evident that the common result of the extrication of hydrogen, during the reaction of zinc or iron with sulphuric or chlorohydric acid, is not a competent ground for assuming that there are, in amphide salts, "compound radicals" playing the same part as halogen bodies.

(*To be continued.*)

MEETING OF THE BRITISH ASSOCIATION AT CORK.

THE thirteenth annual meeting of this Association was held at Cork on the 17th of August.

The Chemical and Medical Sections exhibited in a high degree the utter disregard in which they are held by chemists and medical men. The members were far from numerous; the papers read, few and unimportant, some of them being little better than school-boy productions. Some eminent men attended; among whom we may mention Drs. Kane and Apjohn (president), and Mr. Robert Hunt, the Chemical Section; and Sir James Pitcairn, M.D., and many Irish physicians of whom we in this country know little or nothing, the Medical Section. So much for the members. The principal chemical papers were by Mr. R. Hunt, Dr. Andrews, Mr. T. Spencer, Dr. Draper (of New York), Dr. Apjohn, and Professor Mosander. The principal medical contributions were by Drs. Oliffe, Houston, Harrison, and Pickells.

Such of these papers as appear in any degree worthy of a place in THE CHEMIST will be found in the proper divisions of this Number: had the importance of the meeting warranted it, we would have given a full and detailed report; but as this is far from being the case, we content ourselves with giving brief abstracts of the report of all the sections. The *Athenæum*, to which excellent journal our readers are referred, contains the full report.

The grants of money to the various Sections were as follows:—

Section A.—Mathematical and Physical Science	£1,007
,, B.—Chemistry and Mineralogy	30
,, C.—Geology and Physical Geography	250
,, D.—Zoology and Botany	110
,, E.—Medical Science	10
,, F.—Statistics	0
, G.—Mechanical Science	250
For maintaining and establishing the Kew Observatory	200
To Dr. Carpenter, for researches into the microscopic structure of fossil and recent shells	20
	£1,877

Thus, it appears that the Chemical and Medical Sections will cost £40 in the shape of grants, for the year 1843-4; truly, even this is more than they are worth. It is our opinion that the sooner they are totally abolished the better. They do but disgrace the sciences to which they are devoted. It is our firm conviction that they will never do any good whatever, and if they do, we shall be agreeably disappointed. But the past affords no ground of hope for the future. *A corrupt tree cannot bring forth good fruit.*

We may at a future period resume our observations on this Association; at present, the pressure of other matter compels us to desist.

ON A CHANGE PRODUCED BY EXPOSURE TO THE BEAMS OF THE SUN, IN THE PROPERTIES OF AN ELEMENTARY SUBSTANCE.*

BY PROFESSOR DRAPER, OF NEW YORK.

Dr. Kane described the general properties of the solar beam as acting on chemical bodies, and pointed out the success with which the experiments of Daguérre and Niepcé, Herschel, Talbot and Hunt, had been crowned. He reminded the Section, that in analysing the solar ray, all parts of it were not found equally active in producing chemical effects; and that, in fact, the conclusion was now very generally admitted, that there are three distinct sets of rays in the solar beam:—those possessing heating properties—the calorific rays; those producing the sensation of light—the luminous rays; and those effecting chemical changes, which Dr. Draper proposes to call the Tithonic rays; for, adopting the idea of peculiar matters of light and heat, he considers that the chemical effects are produced by a peculiar material agent, which he terms *Tithonicity*.

Dr. K. then read Professor Draper's paper itself, which commenced by announcing the principle that "Chlorine gas, which has been exposed to the daylight or to sunshine, possesses qualities which are not possessed by chlorine made and kept in the dark. It acquires from that exposure the property of speedily uniting with hydrogen gas. This new property of the chlorine arises from its having absorbed tithonic rays, corresponding in refrangibility to the indigo." The property thus acquired is not transient, like heat, but permanent. A portion of the tithonic rays is absorbed, and becomes latent, before any visible effects are produced. Light, in producing a chemical effect, undergoes a change as well as the substance on which it acts: it becomes detithonized. The chemical force of the indigo ray is, to that of the red, as 66·6 to 1.

The author further remarked, that we are still imperfectly acquainted with the constitution of elementary bodies, since we know, in general, only those properties which they possess after having been subjected to the influence of light.

Professor Stevelly asked if the other gas on which Professor Draper had experimented, the hydrogen, had been found to possess the same property of acquiring this permanent power of combining by exposure to solar light.

Professor Kane replied that the inquiry was so obvious to a person engaged in the research, that he inferred, from the total silence of Professor Draper upon the subject, that hydrogen did not possess the same property.

The Rev. Dr. Robinson begged to state what seemed to him confirmatory of Dr. Draper's views as to the distinction between the *Tithonic* and luminous rays. He was induced by some newspaper statements to suppose that the Daguerréotype might give very exact representations of the inequalities of the lunar surface. He therefore procured the apparatus, and, by practice, acquired the requisite skill. A plate prepared by Claudet's process was then exposed, in the place of the image of a Cassegrainian reflector, of 15 inches aperture. The intensity of the light was such that when the image of the crater Copernicus, one of the brightest in the moon, came into view, it dazzled the eye; but, though the telescope was carried by a clock movement of extreme precision, after an exposure of half an hour, after mercurializing, but a faint and indistinct image, or rather trace, was shown. A second plate, similarly prepared, gave, in half a minute, on a cloudy day, a most perfect picture of his house, in which minute details were shown by the microscope. He therefore inferred, that as the heat accompanying the solar rays was not found in the light of the moon, being probably absorbed there, so these other rays were also absorbed, though perhaps in a less degree. The apparent complementary relation between the color of chlorine and that of the ray which seemed to have the highest power, was curious, and excited a desire to know if anything similar occurred in respect to the vapor of iodine, or if this power were confined to the blue end of the spectrum. The experiment would not be easy, but Dr. Kane could probably manage it.

Professor Kane promised to try the experiment suggested by Dr. Robinson, on his return to his laboratory. He also mentioned, that in the course of certain investigations, he had met with some results, which, now that the subject had been opened by

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* Read by Dr. Kane before Section A, British Association.

Dr. Draper, he was inclined to attribute to the same cause. They were cases of the action of chlorine on organic liquids, in which the action was much more violent with a small quantity of liquid than with a large quantity, as the light, being detithonized in passing through the larger mass, lost its energy in producing chemical action.

Mr. R. Hunt urged the necessity of broadly distinguishing, by appropriate names, the three constitutent kinds of rays which are united in the solar beams—viz., those producing heat, light, and chemical action.

The President (Professor MacCullagh) inquired of Mr. Hunt, whether he considered these three kinds of rays accompanying the solar beam to have the same origin, as, for instance, adopting the theory of vibrations as true for the luminous rays, did he conceive that the calorific and the chemical rays were also merely vibrations in an elastic medium? If so, it was difficult to comprehend the manner in which the permanent effect could be produced without calling in to the aid of the elastic ether, the molecular constitution of bodies themselves. The subject, in his opinion, demanded more attention than had hitherto been bestowed upon it.

Mr. Hunt considered that the three kinds of rays must unquestionably have the same origin.

Dr. Green said, that when he compared the results obtained by Dr. Robinson with those detailed by Mr. Hunt, he was inclined to infer that some permanent change was effected in light by the reflexion at the metallic surfaces of the specula.

Mr. Nott said, that the delicacy and minute exactness of a Daguerréotype drawing executed by the aid of the evening sun, was to a surprising degree beyond the effect of the mid-day sun.

Mr. Hunt said, that he had found the mid-day sun far more energetic and rapid in its effects than the evening sun.

Professor Stevelly said that the two statements were quite reconcileable, as Mr. Hunt spoke of the *rapidity* with which the effect was produced: whereas the statement of Mr. Nott had reference to the *delicacy* and *minute correctness* of the effect.

ON THE HEAT OF COMBINATION.

BY DR. ANDREWS.

The object of this communication was to announce the following general principle, as a consequence of previous researches of the author on the same subject, and to give a general account of some recent experiments which appear to him to establish its accuracy.

The law may be stated as follows:—

"When one base displaces another from any of its neutral combinations, the heat evolved or abstracted is always the same when the base is the same; or, in other words, the change of temperature which occurs during the substitution of one base for another in any neutral compound, depends wholly on the bases, and is in no respect influenced by the acid element of the combination."

To test the accuracy of this principle by direct experiment, equivalent solutions of various salts were decomposed by the addition of a dilute solution of the hydrate of potassa. When the strength of the solutions and their temperatures were properly adjusted, the same variation of temperature always occurred during the decomposition of salts of the same base. If the base (in the state of hydrate) developed, when alone, less heat than the hydrate of potassa in combining with acids, an elevation of temperature occurred during the decomposition of its salts by the latter; if the reverse were the case, the decomposition of the salts was accompanied by a diminution of temperature.

Thus the decomposition of equivalent solutions of the salts of the oxide of copper, was attended by the evolution of the same amount of heat, as was also the decomposition of the salts of the oxide of zinc; but the heat extracted by the former was about twice as great as that extracted by the latter, because the oxide of copper produces less heat in combining with the acids than the oxide of zinc.

The salts of lime furnish an example of an absorption of heat when their solutions are decomposed by potassa—a circumstance which is easily explained by the fact previously established by the author, that the hydrate of lime, when combining with the acids, developes more heat than the hydrate of potassa. But, in accordance with the principle before stated, the diminution of temperature is the same with equivalents of all the salts of lime.

In an inquiry of this kind many precautions are requisite, in order to obtain accurate results. Among the most important may be mentioned, the exact neutrality of the salt to be decomposed, a perfect equality of temperature in the solutions before mixture, and the precipitation of the oxide in the state of a pure hydrate, and not of a subsalt.

Professor Kane considered it highly probable that the law propounded by Dr. Andrews will eventually be judged by chemists to be the most important communication made to this section.

Professor Apjohn observed, that the hydracids and oxyacids developed the same amount of heat in combining with a base.

Professor KANE observed, that if an atom of sulphuric acid be mixed with an atom of water, a considerable degree of heat is developed. Now, the concentrating of this dilute acid was not simply a case of evaporation, but one of decomposition; and it would appear that the same quantity of heat was necessary to effect that decomposition as was developed during the combination.

ON THE FORMATION OF PARACYANOGEN.*

BY MR. T. SPENCER.

THE method by which the author proposes readily to form paracyanogen is, to take a solution of cyanuret of potassium, sp. gr. 1.200 at a common temperature. A current of chlorine is then driven into the solution, until it is thoroughly saturated, which is indicated by effervescence taking place on its surface. While passing the chlorine, the temperature of the solution is rapidly raised, until it amounts to from 180° to 190° Fahr.; and at the period of saturation, dense white fumes are observed to pass off, which afford strong indications of ammonia and cyanogen. At this period of the process the solution becomes dark and turbid, and a black precipitate falls to the bottom of the vessel. If left to stand for a few hours, it will be found that a copious precipitate has settled, and that the solution has assumed a scarlet color. The liquid being decanted, the precipitate is collected on a filter and washed.

This last operation should not be performed oftener than necessary, as the paracyanogen thus formed is slightly soluble in water. This is the only property which it seems not to have in common with the same substance formed by heat in the crucible, which the author supposes renders this substance harder than when formed in the humid way.

The cyanuret of potassium used was prepared in the way recommended by Liebig. When the solution has absorbed one or two volumes of chlorine, it acquires a very beautiful red color, which gradually becomes an opaque scarlet. Chlorine may still be driven through the decanted solution, and fresh portions of paracyanogen obtained.

Experiments were made with bromine and iodine; and it was found, that, by combining these substances with the cyanuret of potassium, paracyanogen is formed in the same manner as with chlorine.

ON A REMARKABLE CASE OF CORROSION OF LEAD BY SPRING WATER, AFTER PASSING THROUGH AN IRON PIPE.*

BY MR. WEST.

IN the case related, the water of a spring, which had flowed into and from a leaden reservoir for sixty years without injury to either, and which passed through leaden pipes without metallic impregnation, when further conveyed a long distance, through iron pipes, contained lead in solution, and was so destructive to the bottoms of the leaden cisterns, into which it next flowed, that some of them had to be renewed in five or six years.

Mr. West stated the analyses of the water in question, which, except as to the lead, were the same when taken from all the three situations; he imputes the mischief to contact with oxide of iron from the pipes, and considers that the remedy must be mechanical, by coating the iron pipes or the leaden cisterns with some other substance, so as to preserve the lead itself from contact with peroxide of iron.

ON THE DECOMPOSITION OF CARBONIC ACID GAS, AND THE ALKALINE CARBONATES, BY THE LIGHT OF THE SUN.†

BY PROFESSOR DRAPER, OF NEW YORK.

THE decomposition of carbonic acid gas, by the leaves of plants under the influence of the light of the sun, is one of the most remarkable facts in chemistry.

Dr. Daubeny, in a paper in the Transactions of the Royal Society for 1836, concluded that the decomposition in question was due to the rays of light, a result obtained by the agency of colored glasses, but which does not appear to have been admitted by subsequent authors, who attribute it to the chemical rays. There is but one way by which the question can be finally settled, and that is by conducting the experiment in the prismatic spectrum itself. When we consider the feebleness of effect which takes place, on account of the dispersion of the incident beam through the action of the prism, and the great loss of light through reflexion from its surface, it would appear a difficult operation to effect the determination in this way. Encouraged, however, by the purity of the skies in America, I made the trial, and met with complete success.

The plan pursued was that already described for determining its active ray, in the case of chlorine and hydrogen.* A series of tubes, half an inch in diameter and six inches long, were so arranged, that the colored spaces of the spectrum fell on them. In these tubes, water, impregnated with carbonic acid gas, and containing a few green leaves *(Poaannua)*, was placed. It was expected, that if the decomposition were due to the radiant heat, the tube occupying the red space, or even the one in the extra-spectral red space, would, at the close of the experiment, contain most gas. If it were the "chemical rays," in the common acceptation of the term, we might look for the effect in the blue, violet, or indigo spaces; but if it were the light, the gas should make its appearance in the yellow, with some in the green, and some in the orange. I made the trial several times, and found it much more easy to accomplish than I had anticipated.

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* British Association, Sect. B.

* British Association, Sect. B.

† *Ibid.*

The results were briefly as follows:—

In the tube in the red space a minute bubble was sometimes found, but sometimes none at all. That in the orange contained a more considerable quantity; in the yellow ray a very large amount, comparatively speaking; in the green, a much smaller quantity; in the blue, the indigo, and the violet, and the extra-spectral space at that end, there was not a simple bubble.

From these facts, in connexion with some results obtained by the use of bichromate of potassa, as an absorbent medium, I conclude that it is the rays of light which effect the decomposition, and that the rays of heat and the tithonic rays have nothing to do with the phenomenon. The alkaline bicarbonates are easily decomposed by elevation of temperature, yielding a portion of their acid at the boiling point of water. Instead of using a solution of carbonic acid, I endeavored to effect the decomposition of these salts by leaves in the sunlight, and found that it took place with facility. Nor is the effect limited to the removal and decomposition of the second atom of the acid. It passes on to the first; the neutral carbonate of soda itself decomposing and yielding oxygen gas. In the same way the sesquicarbonate of ammonia may be made to yield a very pure oxygen gas.

Dr. Draper, in concluding this communication, alluded to his method of multiplying the Daguerréotype pictures, and mentions a process of precipitating copper, after the picture has been fixed by gold, by the electrotype process, on the plate, which, as he states, gives a very perfect copy. "It is difficult," says the Professor, "to describe in words the beauty and perfection of these '*copper-tithonotypes*.' The problem of multiplying the Daguerréotype may now be regarded as completely solved."

Professor **Apjohn** made a few remarks on this communication, which announced results so different from our received ideas on the subject, it being generally admitted that the chemical rays were the most active in producing the decomposition of the carbonic acid absorbed by the plant. He then called upon Mr. Hunt, who had paid great attention to this subject, to state the result of his experience to the Section.

Mr. Hunt said, that he had listened with great surprise to Dr. Draper's paper, as from his own experiments with colored glasses and transparent media, carefully analyzed so as to determine what rays were absorbed, and what rays passed through them, he had arrived at conclusions diametrically opposed to those now put forth. He acknowledged that he had never tried the experiment with the pure rays of the prismatic spectrum, but he should certainly lose no time in doing so on his return to England.

Mr. H. then noticed some peculiarities which had been observed in the light of southern climes, to which he was at present inclined to attribute this difference in the result of experiments.

ON THE INFLUENCE OF LIGHT ON A GREAT VARIETY OF METALLIC AND OTHER COMPOUNDS*.

BY MR. ROBERT HUNT.

The author, having briefly detailed the numerous discoveries in this branch of inquiry from the time of the alchemists to the present day, proceeded to describe the results of his experiments, made with nearly every variety of chemical combination. It was not in the view of establishing any theory relative to the solar agency that this matter was brought before the Section, but merely to put upon record a great number of facts, which appear to prove the constant acting of the sun's rays upon all bodies, and to show the boundless extent of this inquiry. It has been shown, by Petit, that light influences the arrangements of crystals. Labadilliére and Michellotti have shown the necessity of light to the development of pores in plants, and its injurious influence on young plants and animals. The experiments of Ritter, and others, down to the time of Niepcé and Daguérre, have shown many peculiarities in the action of this agent. But since that period the list has been wonderfully increased by the researches of Wollaston, of Davy, of Fox Talbot, and, above all, by the extraordinary discoveries of Sir John Herschel.

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* See Professor Draper's paper, page 442 of our present Number.

* *Ibid.*

We are now acquainted with combinations of silver, gold, mercury, and iron, with many non-metallic bodies, which are speedily changed under the sun's influence, and which are sufficiently sensitive to be used as photographic agents. Mr. Hunt has been successful in adding platinum to the list of photographic agents; which metal gives considerable promise of utility in the art. He has also been successful in producing photographic images on the salts of manganese, of tin, of antimony, of lead, of cobalt, and of arsenic. He has produced pictures with chlorine, iodine, and bromine vapors received upon the surfaces of a great variety of metals, and even on wood and on leather; and many of the alkaline and earthy salts have given evidence to this extraordinary property of the sun's rays.

The author contended, that from the extensive series of results which he had obtained, he was fully warranted in expressing it as his opinion that all bodies were constantly under the influence of the solar emanations, undergoing a change of state; that, indeed, photographic images were always formed, on whatever body a shadow fell: we were only ignorant of the immediate agency by which these images could be called forth: but we were rapidly arriving at the knowledge we desired.

Many of the photographic specimens on the table were remarkable for the extreme fidelity with which the images were delineated, and the variety of tints they had assumed.

ON CERIUM, LANTHANIUM, DIDYMIUM, TERBIUM, AND ERBIUM.*

BY PROFESSOR MOSANDER.

This communication contained a minute account of the author's experiments on cerium, in the course of which he detected two new oxides which he has named lanthanium and didymium. His close examination of yttria has also led him to discover, in combination with it, two oxides, to which he has given the names terbium and erbium.

ON THE CALORIFIC EFFECTS OF MAGNETO-ELECTRICITY, AND THE MECHANICAL VALUE OF HEAT.

BY MR. J. P. JOULE.

Although it has been long known that fine platinum wire can be ignited by magneto-electricity, it still remained a matter of doubt whether heat is evolved by the *coils* in which the magneto-electricity was generated: and it seemed not unreasonable to suppose that *cold* was produced there, in order to make up for the heat evolved by the other parts of the circuit. Mr. Joule had therefore endeavored to remove this uncertainty by experiment.

His apparatus consisted of a small compound electro-magnet, immersed in water, revolving between the poles of a powerful, stationary magnet. The magneto-electricity developed in the coils of the revolving electro-magnet, was measured by an accurate galvanometer; and the temperature of the water was taken before and after each experiment with a very delicate thermometer. The influence of the temperature of the circumambiant atmospheric air, was guarded against by covering the revolving tube with tinfoil, &c., and by the adoption of a system of interpolation. By an extensive series of experiments with the above apparatus the author succeeded in proving that heat *is* evolved by the coils of the magneto-electrical machine, as well as by any other part of the circuit, in proportion to the resistance to conduction of the wire and the square of the current; the magnets having, under comparable circumstances, the same calorific power as the voltaic electricity.

Professor Jacobi, of St. Petersburgh, had shown that the motion of an electro-magnetic engine generates magneto-electricity in opposition to the voltaïc current of the battery. The author observed the same phenomenon on arranging his apparatus as an electro-magnetic engine; but found that no additional heat was evolved on account of the conflict of forces in the coil of the revolving electro-magnet, and that the heat evolved by the coil remained, as before, proportional to the square of the current. Again, by turning the machine contrary to the direction of the attractive forces, so as to *increase* the intensity of the voltaïc current by the assistance of the magneto-electricity, he found that the evolution of heat was still proportional to the square of the current. He discovered, therefore, that the heat evolved by the voltaïc current is invariably proportional to the square of the current, however the intensity of the current may be varied by magnetic induction. But Faraday had shown that the chemical effects of the current are simply as its quantity. He, therefore, concluded that in the electro-magnetic engine, a part of the heat due to the chemical actions of the battery is lost by the circuit, and converted into mechanical power; and that when the electro-magnetic engine is turned *con-*

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* Translated by Major L. Beamish, F.R.S.

trary to the direction of the attractive forces, a *greater* quantity of heat is evolved by the circuit than is due to the chemical reactions of the battery, the overplus quantity being produced by the conversion of the mechanical force exerted in turning the machine.

By a dynamometrical apparatus attached to his machine, the author ascertained, that, in all the above cases, a quantity of heat, capable of increasing the temperature of a pound of water by one degree of Fahrenheit's scale, is evolved with the magnetism which possesses a force sufficient to raise a weight of about 874 pounds to the height of one foot.

ON THE RELATIVE ELECTRO-NEGATIVE POWERS OF IODINE AND FLUORINE*.

BY THE REV. T. KNOX.

The object of this paper was to disprove the statement by Brande in his *Manual of Chemistry*, that the fluorides are not decomposed by chlorine or iodine; and to show, as the result of experiments, that fluorine has been erroneously placed above iodine as a negative element.

ON M. REISET'S OBSERVATIONS RELATIVE TO THE NEW METHOD OF DETERMINING NITROGEN IN ORGANIC COMBINATIONS, AND ON THE PART WHICH THE NITROGEN OF THE ATMOSPHERE TAKES IN THE PRETENDED FORMATIONS OF AMMONIA†.

BY H. WILL.

(Continued from page 396).

M. Reiset advances that metallic iron, heated with a solution of potassa, to 266° F. in contact with the air, evidently disengages ammonia, but that it is not the same in an atmosphere of hydrogen gas. This assertion is founded on a mistake. Pure iron may be maintained for several hours in ebullition with a solution of pure potassa, without any disengagement of hydrogen gas taking place; oxidation occurs only by the fusion of the hydrated alkali. If we heat alone several ounces of a solution of potassa, left a long time to itself, in a perfectly clean retort, a slight disengagement of ammonia is observed; but it soon completely ceases.

The very considerable quantities of ammonia, obtained by M. Reiset, are susceptible of only one explanation: that his mixture of soda and lime contained a nitrate, probably nitrate of potassa, which, as Faraday has already indicated, very readily gives rise to a disengagement of ammonia if the slightest trace of it be fused with zinc and an hydrated alkali. If M. Reiset had, in ever so trifling a degree, followed or observed the rules of precaution of the celebrated English philosopher, which he admires with reason, and which evince the most scrupulous attention, he would not have found sources of error in a process which, in this respect at least, deserves no serious reproach.

The presence of nitre in the mixture of soda and lime, employed by M. Reiset, is so much the more probable, as the manufacturers ordinarily add a small quantity of this salt to the hydrate of potassa or soda of commerce in order to improve the external appearance of their product. From the result of M. Reiset, who obtained an excess of 4·8 per cent. of nitrogen in cinchovatine, his mixture must have contained nearly 0·5 per cent. of nitre, if it be admitted that the tube contained 50-60 grammes of it. This supposition also explains, in a much more simple and natural manner, the formation of ammonia in an atmosphere of hydrogen gas as well as the hinted increase of ammonia with the increase by the addition of sugar. The whole quantity of nitre was destroyed by the employment of from one to one-and-a-half gram. of sugar; and it is for this reason that the proportion of ammonia could not be raised. The nitrogen was, doubtless, here condensed in such a manner, that a current of hydrogen gas of more than 12 hours' duration, was not capable of expelling it. In support of my experiments, which I have above given in detail, I may also mention that Mr. Fones informs us that he has also found M. Reiset's assertions inaccurate.

The following are the results which I obtained:—

URIC ACID.

	I.	II.	III.‡	IV.
Substance	4·99	5·14	5·21	5·45
Ammoniaco-hydrochlorate of platinum	26·01	26·91	27·25	28·50
Hundredths of nitrogen	33·08	33·22	33·19	33·19
Calculated	33·36			

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* *British Association.*

† *Journal de Pharmacie,* June, 1843.

‡ Mixed with 4 grains of sugar.

4·17 of urea, mixed with a small quantity of sugar, gave 30·65 of ammoniaco-hydrochlorate of platinum = 46·64 of nitrogen.

HIPPURIC ACID.

I. 8·85 gave 10·73 salt of platinum = 7·7 per cent. of nitrogen.
II. 8 24 ,, 10·2 ,, = 7·85 ,,

ALLANTOÏN.

I. 8·23 gave 45·61 salt of platinum = 35·17 per cent. of nitrogen.
II. 5·47 ,, 30·47 ,, = 35·35 ,,

I now arrive at the second source of error which M. Reiset has discovered in the new method. It consists, according to him, in the reduction of a portion of perchloride of platinum to the state of protochloride, in evaporating to dryness, in a sand-bath, the liquor acidified by hydrochloric acid, and which contains, in many cases, liquid hydrocarbons. An excess of nitrogen should here consequently be obtained, since this protochloride of platinum is insoluble in ether and in alcohol, and this source of error would have so much the more prejudicial an influence on the result, as the conditions of its production—the hydrocarbons which are blackened by hydrochloric acid—exist in greater number. In a direct experiment which I made on this subject with sugar, and in which I conducted the combustion in such a manner that the hydrocarbons, which are produced at a low temperature, floated in great quantity on the hydrochloric acid, I could not perceive any reduction of perchloride of platinum by evaporation in the sand-bath; if it took place, it was only in so light a degree as to have no influence on the result. Moreover, by maintaining the anterior part of the tube at a rather strong red heat, the formation of hydrocarbons, decomposable by hydrochloric acid, is almost completely avoided, since these bodies are so much the more fixed as their production takes place at a more elevated temperature.

The remarkable experiments of Faraday, on the development or formation of ammonia, in the fusion of hydrate of potassa with a metal, or non-nitrogenous organic matter, which I have likewise met with in almost all my experiments (but in so small a proportion as not to be attributable to the nitrogen of the atmosphere), and the experiments of Professor Liebig on the presence of ammonia on rain-water, contain the very simple solution of the question relative to the source of this development of ammonia, so often observed, and which it is almost impossible to avoid.

Faraday's experiments had the object of showing that there exists some unknown source of ammonia, and that the nitrogen of the air does not perform an active part in his investigations; they are so convincing and so free from any all-preconceived opinion, that I cannot help here giving a concise description of them. They prove, in my opinion, precisely the contrary of the conclusion which M. Reiset has drawn from them, and are of the greatest importance to the question of ascertaining if, in the putrefaction of organic matters, in the oxidation of metals with or without disengagement of hydrogen, the nitrogen of the atmosphere performs any active part in the formation of ammonia, since the affirmative or negative answer to this question has an essential influence on the theory of the nutrition of plants.

Faraday observed that an organic matter, in which he wished to ascertain the presence of nitrogen, gave him ammonia in its fusion with hydrate of potassa, whilst he could not obtain any by heating it alone in a tube. By extending his investigations, he found the same phenomenon with many non-nitrogenous organic matters, as well as with a great number of metals, such as iron, zinc, tin, lead, arsenic, and copper. He obtained, for example, with ligneous fibre, oxalate of potassa, oxalate of lime, tartrate of lead, acetate of lime, and asphaltum, very considerable quantities of ammonia; acetate of potassa, acetate and tartrate of lead, tartrate and benzoate of potassa, oxalate of lead, sugar, wax, olive oil, and naphthaline yielded him very little; resin, alcohol, ether and olefiant gas gave him none at all. The quantity of ammonia sensibly increased with that of the hydrate of potassa employed in the experiment. He observed, besides, that perfectly pure hydrate of potassa, heated until no more water is disengaged, does not give ammonia when heated alone, but that it acquires this property after being exposed some time to the air. He obtained the same result with caustic lime and hydrate of lime, as well as with a recently prepared solution of potassa, which had been left to itself four-and-twenty hours.

Moreover, Faraday obtained ammonia by heating, in an atmosphere of hydrogen gas, prepared with the greatest care, a strip of zinc perfectly cleaned with hydrate of potassa, in the preparation of which, potassium was was employed; but he was unable to observe ammonia by heating with zinc hydrate of potassa which had previously been kept in fusion, until no more water was disengaged from it. Faraday states, likewise, that the presence of ammonia was ordinarily perceptible before the commencement of the decomposition of the matter submitted to experiment, and of the disengagement of hydrogen.

Tartrate of lead was heated to redness with potassa, and the cooled residue, put in contact with a drop of water, gave ammonia.

White clay of Cornwall, which had been exposed to the air for eight days, after having been heated to redness, gave much ammonia; whilst another similar portion of this clay, which had been kept in a well-closed flask after calcination, yielded none.

Pure sea-sand, heated to redness in a crucible, and cooled on a copper plate, gave no trace of ammonia, whilst its presence was very evident when this same sand was held for some time in the hand, and stirred with the finger before being heated. By the side of these experiments may also evidently be ranked the observations of M. Braconnot, according to which many porous minerals, such as the eurite, some granites, ophite, the serpentine of Vosges, amphibole, the carbonate of lime of shells, &c., &c., give an ammoniacal product during distillation in glass retorts.

Faraday's experiments demonstrate, with the greatest precision, that ammonia is not formed, but that it already exists, in the substances employed, or that it is derived from the air in their exposure to that fluid. The quantities obtained are very slight, although Faraday has not determined them.

Now, I have proved, in the foregoing experiments, the accuracy of Faraday's data, and I have shown, at the same time, that the nitrogen of the atmosphere does not possess the property of combining with hydrogen, at the moment when the latter is separated from a combination to form ammonia; if it were thus, the experiments with tin, iron, and sugar (in which the successive elevation of temperature of the substance with the hydrated alkali, in contact with a continued current of air or nitrogen, presented, in as favorable a manner as possible, at every moment of the combustion, the conditions of the formation of ammonia), should have given an appreciable proportion of ammonia, and in relation with the duration of the experiment, or the quantity of the substance; but it is not so, and extreme attention enables us to avoid any trace of ammonia, notwithstanding the contact with hydrogen in the nascent state with nitrogen.

If, now, it be considered that ammonia constitutes a constant principle of our atmosphere; that, moreover, there exists no substance more easily absorbed by liquids or porous bodies, especially when they at the same time possess the properties of an acid, it is easy to conceive that, being, in possession of extremely delicate means of detecting the slightest trace of ammonia, this volatile alkali should be found in all, or almost all substances which have been exposed to the air.

These facts without difficulty explain the reason why Faraday did not observe ammonia with the first hydrate, recently fused, of potassa and zinc, or resin, which is not a porous body, whilst notwithstanding the resins act with the hydrates, during fusion, like other organic matters, inasmuch as they are equally decomposed by their action, giving rise to a disengagement of hydrogen. In certain cases, in which Faraday observed ammonia, a small proportion of *nitrogen* might also have been the partial or sole cause of the disengagment of ammonia. In support of the presence of nitrogen in the zinc of commerce may be mentioned, for example, the circumstance that the flocculent black residue, which is always obtained by the solution of the metal in sulphuric acid, after a careful watching, disengages very considerable quantities of ammonia, when heated with very pure hydrate of soda. *Cast iron* likewise contains nitrogen, according to Schaffhaütl.

It is precisely the same with the assertion contained in all works in chemistry, that iron, in its conversion into oxide under the influence of moisture and of air charged with carbonic acid, forms the nitrogen of the air into ammonia, as with the preceding cases of the pretended formation of ammonia. This production of ammonia, if it were real, would suppose that iron decomposes water at the ordinary temperature, disengaging hydrogen from it, which is not the case. It would likewise suppose that the hydrogen liberated has a much greater affinity for nitrogen than for the oxygen of the air, which is entirely in contradiction of our ordinary observations. At a temperature at which iron decomposes water, there is no more formation of ammonia; for Kuhlmann *(Memoir on the Formation of Nitre)* obtained by passing steam and nitrogen over pyrophoric iron heated to redness, only hydrogen and nitrogen, but not ammonia.

I have repeated the experiment of Mr. Austin, whose result had already been questioned by Mr. Hall, putting myself as much as possible under shelter from the ammonia of the atmosphere (but not from its carbonic acid); I put into a flask, of the capacity of about a gallon, 1½lb. of iron nails, previously freed from all oxide by means of diluted hydrochloric acid, and well washed with pure water, and I covered the bottom of the vessel with distilled water. By means of a bent and hermetically adapted tube, the flask was put in communication with a smaller one, containing a smaller quantity of very dilute hydrochloric acid. In the cork of this smaller vessel, which had been pierced with two holes, was adapted a tube containing asbestos, imbued with pure sulphuric acid, and by which the external air communicated with that of the large flask. The object of the dilute hydrochloric acid was to prevent the ammonia, which might be formed, from passing into the sulphuric acid.

Every day, by means of a second tube placed in the first flask, and which I closed with wax, I removed the atmosphere in such a manner that the air introduced should traverse the tube containing sulphuric acid. After from fourteen to sixteen days' oxidation, when a very considerable quantity of oxide was formed, the latter was removed from the flask by the employment of water and a small quantity of dilute hydrochlorie acid, and completely dissolved in this acid; the liquor, after chloride of platinum had been added to it, was evaporated almost to dryness in a sand-bath; the residue was completely re-dissolved in a mixture of alcohol and ether, and did not deposit ammoniaco-hydrochlorate of platinum, even after a repose of twelve hours. The hydrochloric acid of the smaller flask also presented no trace of ammonia. If the iron was here oxidised at the expense of the water, and if the hydrogen thus liberated had formed ammonia with the nitrogen of the air, nearly three grammes of ammonico-hydrochlorate of platinum, for every gramme of oxide produced and submitted to the above treatment, should have been obtained. Such a quantity could not escape observation.

There is, therefore, no doubt that the ammonia observed in rust proceeds from the atmosphere.

In a memoir on the putrefaction of wood, Hermann mentions an experiment, according to which, fresh wood, during its putrefaction, directly absorbs nitrogen from the atmosphere, a portion of which is converted into ammonia. Hermann found, by analysis, in the products of the putrefaction of wood, only one-third of the nitrogen which, according to his experiment, had been added to the elements of the wood. He admits, then, that the other two-thirds were evaporated under the form of ammonia.

The most simple act of destruction with which we are acquainted, is the production of acetic acid by alcohol.

If the nitrogen of the atmosphere had the faculty of taking part in it, by the process of rapid acetification, in which the ligneous fibre undergoes, concurrently with the alcohol, a slow destruction, and which, consequently, also presents all the conditions of the formation of ammonia, instead of pure acetic acid, acetate of ammonia should be obtained. Hitherto, the formation of ammonia has not been observed in this process.

The act of destruction of non-nitrogenous organic matter, or of those which contain very little nitrogen, which is operated on the surface of the earth, commences as soon as these last are constituted in the state of life; it is so general, and so diffused, that on account of the difficiency on the part of *nitrogen* (as an element) of a circulation similar to that of the oxygen, our atmosphere would be infected with ammonia, and its proportion would certainly be diminished, if this gaseous element, the most indifferent of all, possessed the faculty of contributing in this state to the formation of ammonia.

INVESTIGATIONS CONCERNING CASEÏN.*

BY F. ROCHLEDER.

Although caseïn has been made the subject of investigations by several of the most distinguished chemists, our knowledge concerning this body is still far from perfect. The data of those who have been occupied with its study present numerous contradictions, and it is only by continuing the researches that the key to their explanation can be discovered.

The greatest difference of the data concerning the properties of caseïn arises from its solubility and the action of acids on its solution.

It is stated that caseïn is soluble in considerable quantities in water, and also that it acts with the acids nearly in the same manner as albumen; that is to say, that it forms a combination soluble in water with a small quantity of acid, and insoluble with a larger quantity (Berzelius, *Treatise on Chemistry*).

The solutions of caseïn in water should be precipitated by a slight addition of an acid. *Ibid.* According to Simon (*Manual of Chemistry applied to Medicine*, vol. i., p. 68), half a drop of acetic acid is sufficient to produce in it an abundant turbidness.

It is absolutely impossible to understand how caseïn, soluble in the dilute acids, can be precipitated from its solution in water by the dilute acids, especially since I am convinced that caseïn in contact with the dilute acids is dissolved in greater quantity than in water.

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* *Annalen der Chemie und Pharmacie.*

Professor Liebig has likewise observed that caseïn is precipitated from its solutions in the dilute acids, if they be saturated by the addition of an alkaline carbonate.

From this experiment it results that pure caseïn should be insoluble or very sparingly soluble in water, and that its solubility is due to the presence of other substances.

The observations contained in this memoir also increase the probability of this supposition.

Vogel has remarked that soluble caseïn, prepared according to the process of Berzelius, leaves a considerable quantity of ashes after combustion, and that the presence of lime or baryta may be demonstrated in the latter, according as carbonate of lime or baryta has been used for removing the acid which cannot be got rid of by washing, and which caseïn retains after its precipitation from milk by an acid. Simon has confirmed Vogel's observation.

Scherer pointed out the action exerted on the solubility of caseïn by the fixed substances which accompany it; he has shown that caseïn submitted to ebullition with alcohol is partially dissolved; that all the alkalis which accompany caseïn are employed in its solution, and that the residue insoluble in alcohol owes this insolubility only to want of alkali. The investigations of Scherer have rendered extremely doubtful the solubility of caseïn in the pure state.

Mulder, to whom we are indebted for our first knowledge concerning the composition of caseïn, has shown that the coagulum obtained by gently heating milk with dilute sulphuric acid is not pure caseïn, but a combination of caseïn with sulphuric and phosphoric acids.

This chemist found, besides, that a combination of caseïn with phosphoric acid may be obtained by using acetic acid for the coagulation of milk, by means of the decomposition of the phosphate of lime by this acid.

The process which Mulder employed to obtain these combinations of caseïn with the acids in the state of purity, demonstrates that they were insoluble in water and in alcohol.

This fact is in contradiction of the assertion of Berzelius, that caseïn, like albumen, gives, with a little acid, a combination soluble in water, and, with a greater quantity of acid, a combination insoluble in that liquid, which would yield to water, by washing, the excess of acid, and would become soluble in it.

If it were thus, the combinations of caseïn with the acids, obtained by Mulder, should immediately dissolve in water; in other terms, should not coagulate milk, or else the coagulum should be dissolved by washing with water, losing the excess of acid.

Thus the properties indicated by Berzelius do not belong to the combinations of caseïn with the acids, or else the precipitates obtained by Mulder were not combinations of this nature; but they were found in them only in the state of mechanical mixtures and obstinately retained.

According to Fromherz and Gugert, the combinations of caseïn with the acids, insoluble in water, easily dissolved in alcohol. Mulder has, on the contrary, boiled several times in alcohol, in order to free them from fatty matter, the combinations, insoluble in water, of caseïn with the acids, which he had prepared. This mode of purification could not have been employed if these compounds had been soluble in alcohol.

In order to arrive at certainty in all these respects, at the invitation of Professor Liebig, and taking as a point of departure his above-mentioned experiment, I undertook the following researches in the laboratory at Giessen:—

With the view of obtaining caseïn in the pure state, I added dilute sulphuric acid to recent milk, and I heated the mixture. The caseum, which separated, was then collected in a coherent mass; this was kneaded with pure water renewed several times in order to free it from the greater part of the serum which it retained, and was then treated, cold, by a concentrated solution of carbonate of soda, until the whole of the caseïn was dissolved, forming a turbid, syrup-like liquor.

This solution, which contained a small quantity of carbonate of soda in excess, was left to itself at a temperature of 68° F., until the butter separated formed a layer on its surface.

It is advantageous to use, for this purpose, very flat vessels, because the promptitude of the separation is in direct ratio to the shortness of the road which the butyraceous particles have to travel.

The greater part of the butter was removed, and then, by means of a syphon, the liquid under the layer of butter was drawn off.

The caseïn was precipitated, *de novo*, by dilute sulphuric acid, from its solution in carbonate of soda, and kneaded with water frequently renewed to free it from the greater part of the acid and sulphate of soda which it retained.

The solution of caseïn in carbonate of soda, and its precipitation by dilute sulphuric acid, were repeated three times, in order to separate from it the butter and the organic principles.

I purposely avoided filtering the solution of caseïn in carbonate of soda, because a concentrated solution passes very slowly through the filter, because caseïn in solution in the alkalis is easily altered; and because saturation by an acid precipitates caseïn in very dilute solution, not in the state of a coherent mass, but under the form of finely divided flocks, but which can be separated from it only by filtration, and then it is very difficult to avoid alteration by the filaments of the paper.

Caseïn, thus obtained, still contains sulphuric acid; when it is put in contact with the water, this acid renders it partially soluble, especially at a high temperature.

This solution forms on its surface, by evaporation, a transparent pellicle which is renewed after it has been removed.

If we add to this liquor a solution of carbonate of soda, the caseïn, held in solution hy sulphuric acid. is precipitated in voluminous white flocks, which are redissolved in the least excess of the precipitant.

After having removed a considerable portion of the acid by washing with water at the ordinary temperature, from sixty to seventy times its weight of pure water is poured on the caseïn, in a capsule, and it is heated to ebullition; it is then left to repose. After it has deposited, the super-natant liquor is decanted, and this operation is repeated with a fresh quantity of pure water.

By this process no loss of substance is experienced, since, by the addition of a small quantity of carbonate of soda, all the caseïn contained in the washing waters, may be precipitated from its combination with sulphuric acid, and may be obtained in the state of purity by washing it with water, alcohol, and ether.

After fifteen or twenty repetitions of the treatment of caseïn by water, in the manner above indicated, this substance lost, with the acid which it contained, the property of dissolving in water; this liquid could then dissolve only small quantities of it.

In order to remove the last portions of fatty matter which the caseïn might still retain, at the same time as the water which swelled it up, it was submitted to ebullition with absolute alcohol, and then with anhydrous ether, until these liquids gave no residue by evaporation.

To convince myself of the absence of sulphuric acid in the caseïn obtained in this manner, I dissolved it in carbonate of potassa. I evaporated the solution to dryness, and I heated the product in a close vessel until the caseïn was completely destroyed; I poured on the residue water acidulated with a small quantity of hydrochloric acid, and after the disengagement of sulphuretted hydrogen, I added a solution of chloride of barium, and sulphate of baryta was not formed.

I made a second experiment with the same object; caseïn, arising from the same preparation, was dissolved in carbonate of soda and submitted to ebullition; the solution was decomposed by hydrochloric acid, and filtered. I added chloride of barium to the filtered liquid, without sulphate of baryta being formed.

As these experiments proved the absence of sulphuric acid in pure caseïn, extracted by that acid from its solution in carbonate of soda, it might be expected that it would no longer retain any traces of the other acids used in precipitating it from its solution in the alkalis.

In order to demonstrate it by experiments, caseïn, obtained in the manner above indicated, was dissolved in carbonate of soda, precipitated from this solution by acetic acid, and then heated by the process indicated for that which had been precipitated by sulphuric acid.

The caseïn thus obtained, treated by alcohol and ether, had absolutely the same properties as the caseïn precipitated by sulphuric acid. Moistened by concentrated sulphuric acid, it did not give any odor of acetic acid. It was, moreover, impossible to demonstrate the presence of this acid in the water, which was deposited against the sides of a cooled glass vessel held over a heated mixture of caseïn and dilute sulphuric acid.

Mulder already indicated that the precipitate produced in milk, by acetic acid, does not contain that acid. Now, as caseïn, precipitated from its solution in carbonate of soda, by sulphuric and acetic acids, does not contain any traces of these acids, it results that these acids precipitate caseïn from its solution in the alkalis, not in the state of combination with the acids employed in the decomposition, but pure and free from acids; it is precipitated in this latter state on account of its sparing solubility in water, as soon as the acids are combined with the bodies to which its solubility is due.

In this case caseïn, by whatever acid it may be precipitated, should present the same composition. Caseïn precipitated by sulphuric acid should not present less carbon and hydrogen than that precipitated by acetic acid.

The analyses of caseïn obtained in different manners confirm this supposition.

I. 0·3265 of caseïn precipitated by sulphuric acid and purified in the manner above described gave 0·6445 of carbonic acid and 0·2090 of water.

II. 0·333 of casein which had been precipitated by the solution of carbonate of soda from its solution in dilute sulphuric acid, gave 0·6530 of carbonic acid and 0·212 of water;

III. 0·615 of caseïn prepitated by acetic acid, gave 1·212 of carbonic acid and 0·3975 of water;

Which corresponds in 100 parts with the following composition:—

	I.	II.	III.
Carbon =	54·27 ..	53·93 ..	54·19
Hydrogen =	7·11 ..	7·07 ..	7·17

0·4604 of caseïn employed in analysis I., and which had served for the preparation of the products whose analyses are mentioned under the numbers II. and III., left, by combustion, 0·0015 of ashes; that is, 0·3 per cent.

These analyses, which completely agreed with one another, give a rather higher proportion of carbon than the average numbers deduced by Dumas from his numerous analyses. This difference may be explained by that of the modes of desiccation employed by Dumas and myself.

I dried the substance at 261° F., whilst Dumas dried it *in vacuo* at 252° F.

In order to ascertain that there is no other reason for the difference, I heated for three days at 212° F. caseïn arising from the same preparation as that employed in analysis I., and then I calcined it. It had then kept its white color, whilst the caseïn dried in the oil-bath had acquired a yellowish tint.

0·7055 of caseïn dried at 212° F. yielded by combustion (which I operated like the preceding with chromate of lead) 1·36 of carbonic acid, which is equal to 53·33 of carbon per cent.

The difference is owing, therefore, to the different mode of drying.

Caseïn, obtained by one of the foregoing processes, is very sparingly soluble in water. Some caseïn was left for three hours in contact with water at a temperature near ebullition, and it was afterwards boiled for half an hour; 18·989 of the cooled and filtered solution then left a residue of only 0·0045 of caseïn after evaporation in the sand-bath and desiccation at 252° F., which is equal to 0·237 parts of caseïn to 100 of water.

Whether precipitated from its solution in the alkalis by an acid, or from its solution in acids by carbonate of soda, caseïn always possesses the property of reddening litmus paper, and retains it even after desiccation at 261° F., without communicating it to the water with which it it is boiled.

This re-action agrees very well with the property possessed by caseïn of forming neutral liquors with the solutions of alkaline carbonates; it also accords with that of causing the alkaline re-action of phosphate of soda to disappear. This salt, in solution in water, dissolves a very great quantity of caseïn, and forms with it a mucilaginous frothy liquor, which it is impossible to obtain perfectly clear by filtration, and which, after evaporation in a sand-bath, leaves the combination of caseïn and phosphate of soda, under the form of a nitreous pellicle, detaching itself from the sides of the vessel. 20·5327 of a solution of caseïn in phosphate of soda, which had been diluted with a very great quantity of water, and which was left for several days at the ordinary temperature in contact with a great excess of caseïn, after evaporation in the sand-bath and desiccation at 212° F., left a residue of 0·1098, which answers for 100 parts of water to 0·5349 parts of the combination of caseïn with phosphate of soda.

Notwithstanding the acid re-action, caseïn, put in contact with bicarbonate of potassa, does not expel carbonic acid at the ordinary temperature.

The substance is dissolved with facility and in considerable quantity in the carbonated and caustic alkalis, and is precipitated from these solutions by all the acids except carbonic acid.

The precipitate is re-dissolved in a great excess of acid. The solutions of caseïn in the dilute acids are turbid, cannot be obtained clear by filtration, froth by agitation, like solutions of soap, and by evaporation are covered with a transparent pellicle, which is renewed after it is removed.

If to a solution of caseïn in an acid another of a salt of baryta be added, turbidness is produced by the formation of an insoluble combination of caseïn with baryta, even when the quantity of caseïn is very small.

From the foregoing investigations it results that pure caseïn is almost completely insoluble in water; that the so-called soluble caseïn is a combination of caseïn with potassa, soda, or lime; that the coagulation soluble of caseïn by the acids consists only in the combination of acid with the potassa soda, or lime of the combination; the caseïn separated from the liquor can then no longer remain in solution, being insoluble as it is in water; but it precipitates (coagulates).

These investigations demonstrate, besides, the reason why the solutions of potassa are endowed with the property of opposing coagulation when added in very small quantity to milk, and also give an explanation of the coagulation of milk by slight causes, especially in the warm summer months. It is only necessary for an infinitely small quantity of lactic acid relative to the mass of the milk, to be formed, to saturate the very small proportion of soda which is sufficient to hold in solution an enormous mass of caseïn.

DR. URE'S "REVENUE IN DANGER FROM SPURIOUS CHEMISTRY."

To the Editors of "The Chemist."

Gentlemen,—

I send you the following remarks on Dr. Ure's pamphlet, entitled "The Revenue in Danger from Spurious Chemistry," which contains some most illiberal observations on Professor Graham, feeling confident that you will gladly lend your pages to do an act of justice to an amiable and enlightened individual.

In this pamphlet Dr. Ure vainly endeavors to injure the high reputation of Graham, which ranks him amongst the most scientific chemists of the present day. "Sed, risum teneatis amici," he has the absurdity to assert that *he* may be a better chemist than the Professor of the London University. The scientific world foolishly thinks otherwise, but it is mistaken, for it is evident in such a case the doctor himself is the best judge. For once in his long life he happens to be right by chance, and, blushing to find it fame, pens thirty-six pages to prove what no person ever doubted; for if the fluid erroneously termed naphtha had been sent to the laboratory in Giessen (along with Dr. Ure's pamphlet), thirty of the fifty students there would have ascertained its true constituents, and thus, according to the chemical lexicographer's logic, they would be more eminent chemists than Graham. It is a delightful reflection that "Sparta has many a worthier son than he." Dr. Ure, who has experienced "anxieties and dangers," must be told that for the accomplishment of any great object the analytical mind is not of the highest order, and hence the chemist who neither possesses nor exercises at least an equal degree of synthetic knowledge is unqualified for a high office, and would only impede the progress of art and science. I would delicately hint that when the Analytical Chemist to the Board of Customs publishes his next effusion upon Wood and Vinous Spirit, that, to borrow a metaphor from the turf, he will "place" the European chemists as follows:—Berzelius, Liebig, Dalton, Gmelin, Graham, Dumas, Kane, Gay-Lussac, Mitscherlich, Rose, Thenard, Faraday. I myself have heard Liebig and others say, "that Graham, as a chemist, holds the first rank in Britain."

What has Dr. Ure done for the science of chemistry? His "Dictionary on the Arts and Manufactures" is chiefly compiled from German authors.

As it is perfectly well known that Mr. Brande committed the same mistake, why did not the Doctor also include him in his censures? Is it, as it is whispered, that he is casting a sheep's eye on the chair of the Royal Institution? or, what is far more likely and more interesting, on the Mint? Having so far censured, let us now praise; "it is certainly the best specimen of *Uric* acid that has ever fallen under my observation."

These remarks have only just reached me from the University of Giessen, for they were penned almost immediately on the publication of Dr. Ure's pamphlet, which roused the indignation of those who hold Mr. Graham's talents in high estimation.

I am, Gentlemen,
Respectfully yours,
A Chemical Student.

[At the period of the publication of Dr. Ure's pamphlet, we purposely abstained from taking any notice of the subject of it. We read it, however, and were much struck with the malicious spirit that pervaded the production. In our opinion, Professor Graham has little cause to be angry with the Doctor's expressions; if he regarded them, or the quarter from which they emanated, we are much mistaken. Mr. Graham's reputation is so firmly fixed, and on so high a basis, as to defy the spite and malice of even more formidable assailants than the Chemist to the Customs.

With regard to the matter and manner of dispute between the Doctor and Professors Graham and Brande, we will only observe that in a similar case we should have acted very differently towards gentlemen and professional brethren. The whole pamphlet evinces a desire to profit by the occasion. We recommend the Doctor, when next he endeavors to extract the *beam* from the eye of another, previously to disencumber *his own* of the *mote*.]

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

THE SMOKE NUISANCE.

A FEW remarks on this subject appear particularly called for at the present time, when legislative interference is likely soon to be interposed to suppress the nuisance, and while much difference of opinion exists among manufacturers as to the best means to be adopted for preventing the emission of smoke from their factory chimneys.

For upwards of 20 years many plans have from time to time been suggested for the *combustion* or *prevention* of smoke, but with what success we are left to judge from the fact that none of them singly, or any combination of them, has been generally adopted. What we therefore propose is to to examine into the probable cause of this extensive failure of the numerous ingenious plans proposed for "smoke burning," and to suggest what appears to us the only sure method of effectually, and economically, securing the great benefit to be derived from an improved method of constructing furnaces to secure the perfect combustion of the fuel, whether of its solid portion, or of its aëriform or gaseous products.

All the plans devised for burning coal without the emission of smoke from the chimney top, are, 1st, dependent on mechanical arrangements, without any consideration for the nature of the fuel, or its resulting products; or, are, 2nd, mechanical arrangements calculated to favor certain well known chemical conditions.

To the first class belong all those patented furnaces called "smoke burners," for—as Watt described the process—"passing the smoke *over, through, or among red hot fuel.*" Some of these inventions provide double grates, others revolving grates, some have an endless chain of bars, &c., &c.; another kind takes the smoke from the chimney by means of a fan and blows it into a closed ash-pit, whence it passes through the incandescent fuel on the grate. [All these methods literally provide for *burning smoke,* and the patentees have put on record in their specifications their ignorance of the chemistry of combustion, by claiming only to purifying the smoky vapor of its blackness by the action of heat, instead of first ascertaining its origin, and then endeavoring to prevent the very formation of smoke. The "smoke burning furnaces" provide, in fact, for burning the largest quantity of fuel with the smallest quantity of air, than which nothing is more opposed to the simplest of chemical facts, viz., the large quantity of air required by the gaseous products of the coal.

The second division of the methods under consideration provides for the admission of air to the gases of the fuel, whether olefiant gas, carburetted hydrogen gas, or carbonic oxide. These methods may be said to have little to do with the furnace itself; the grate, ash-pit, flame bed, flues, &c., remain unaltered, and what is chiefly attended to is the admission of air. These plans may be designated the chemical processes, the others being entirely mechanical, and opposing, rather than favoring, chemical views.

Air may be employed either hot or cold. Many methods have been used to heat the air, as by hollow bars, dead-plates, and by coils of pipe placed in the chimney as used by Mr. Coad, or by a series of vertical pipes —an improvement on Mr. Coad's plan, patented by Mr. Samuel Hall. Two difficulties occur through heating the air: 1st, that of obtaining sufficient air in the furnace; and, 2nd, every measure of heated air contains less oxygen than air of atmospheric temperature; and it being the oxygen alone that we require for promoting the combustion of the gas.

Of the hot air plans we hear of very few being in use, and they only partially answer, where the coal is not bituminous. Mr. J. Parkes, about 20 years back, admitted air through a double bridge, by which it entered in one sheet or stream of the full width of the furnace; but to this method there were many practical objections. Another, and a highly ingenious plan is that of Mr. Charles Wye Williams, manager of the City of Dublin Steam Packet Company. It consists in the direct admission of air to the coal and other gases, in the form of small films or jets. The apparatus for throwing in the air is placed in front, at the sides, at the top of the furnace, or behind the bridge, as circumstances require, the patentee having stated in his claim that he does not confine himself to the particular number, situation, or dimension of the several parts of the air-distributing apparatus. Mr. Williams is the author of an elaborate treatise on the *Combustion of Coal* chemically and practically considered, which manufacturers desirous of obtaining information on this important subject will do well to peruse.

What has been long well known in laboratory experiments, Mr. Williams has very ably and ingeniously applied on the large scale of the furnace. It is a plain and simple fact that every fresh charge of fuel is attended with a sudden and large evolution of crude coal gas requiring air in the proportion of about ten measures of air to one measure of gas, or more correctly for the various gases as follows:—

Bicarburetted hydrogen	H^3	C^6
Carburetted hydrogen	H^2	C
Carbonic oxide	O	C^2

requiring to a measure of each for the first, 15 measures of air, for the second, 10 measures, and for the third, 5 measures.

Mr. Williams's method is called the "Argand Furnace," and in principle it agrees precisely with the Argand oil in gas lamps. The division of the air into small streams is undoubtedly the best for obtaining the rapid and intimate admixture of the air and gas, and the admission of the air at the common temperature brings more of the atmospherical oxygen in the same space than if the air were heated, particularly when the air is admitted at the ordinary pressure, and not impelled by a fan or other blower. If we take, for example, a cubic foot of coal gas, and 10 cubic feet of air, it is almost self-evident, that, to get them mixed, we must divide one or both into small streams, otherwise we shall have imperfect combustion and a deposition of carbon, which, mixed with the usual products of combustion, would afford what is popularly called smoke, but which, having no other combustible in it than the carbon, cannot be economically consumed, though it may be scientifically and most advantageously prevented.

The attempts to consume *smoke*, instead of being directed to the conditions requisite for the perfect combustion of the gas have led to many serious and expensive blunders, and as no plan can be lasting which is based on incorrect principles, though it may be temporarily forced into use, and for a while deceive the unsuspecting, we have much pleasure in bearing testimony to the leading facts of the case as respects the abatement of the smoke nuisance, and may safely affirm that unless based on chemical principles no plan can be safely and satisfactorily recommended. The smoke being the result of the imperfect combustion of the impure gas, all we have to do is to provide sufficient air, in the best manner, to to obtain its perfect mixture preparatory to its ignition, and by no other method can economical combustion be conducted.

THE HEALTH COMMISSION.

Liverpool, Sept. 15th, 1843.

To the Editors of The Chemist.

GENTLEMEN,—

As an inhabitant of the town of Liverpool, may I be permitted, through the medium of your journal, to express my surprise at the appointment of Mr. Lyon Playfair as the Commissioner to inquire into the state of this town as regards the health of its inhabitants?

I should like to know, as would many of my fellow townsmen, the qualifications which the Government have discovered in Mr. P. to render him eligible for such an important office; if they have found these qualifications in him, they have been more fortunate than the great bulk of men: this may, perchance, be due to their greater penetration and discernment.

For my own part, but with all due deference to the sagacity of Her Majesty's advisers, I consider this appointment anything but *fair play* towards the people of Liverpool, and an insult to their understanding. Here we have many eminent men of science, and men possessing an intimate acquaintance with the town, and why, may I ask, should they have been passed by and a person almost as great a stranger to the town as to science, selected in preference?

It may be supposed that this complaint emanates from one whose jealousies are excited; but I assure you that this is not the case, for my risible organs were those which were most acted on when I read the whole list of Commissioners, and meditated over the respective claims of each individual.

It must be evident to any mind capable of reflection, that, to fulfil the legitimate objects of such a commission, men should have been chosen and appointed to those localities with which they were absolutely intimate; men with a perfect acquaintance with the manufactures carried on in the town and its vicinity; with a knowledge of what those works discharge into the waters and into the atmosphere; in fine, possessing a thorough acquaintance with everything that pertains to the place.

The fact of a man being chemist to an agricultural society, however well he may fulfil that occupation, and whatever absurd theories he may be able to create, wherewith to amuse its members, can be no proof of fitness for the office in question.

Oh, when will our Governments lose

their propensity for jobbing? Alas! commissions of this kind are temptations which the purest Administrations cannot refrain from rendering worse than useless, from inclinations which are natural to them, and which, to use a vulgar but truthful expression, are "born in the flesh and bred in the bone."

I am,
Gentlemen,
Your obedient servant,
A Liverpool Man.

MEMOIR ON THE ELECTRO-CHEMICAL APPLICATION OF OXIDES AND METALS ON METALS.*

BY M. BECQUEREL.

I. OF THE EMPLOYMENT OF THE OXYGEN GAS APPARATUS FOR THE FORMATION OF HYDRATED PEROXIDE OF LEAD, AND THE APPLICATION OF OXIDES ON METALS.

GENERAL CONSIDERATIONS.

I have long since devoted myself to proving, by mentioning many new facts, that we cannot dispense with bringing forward the action of affinities and that of electrical forces, for the advancement of physico-chemical sciences. Experience daily effectually proves to us that this simultaneous action of two forces which are inseparable, and of which one may serve to reproduce the other, and *vice versâ*, are of a nature to extend the dominion of chemistry and its applications to the arts. The results given in this Memoir, of which I now communicate only the first part, will furnish new proofs of it; at the same time they will demonstrate that metallic contact, not followed by a chemical action, is absolutely without influence on the electro-chemical effects, and that attention should no more be paid to them, in the fear of their being stopped by discussions of principles which leave the partisans and adversaries of Volta's theory in the same circle of ideas, without, in the end, any real advantages resulting to science.

Some years ago, I described a simple electro-chemical apparatus, by means of which oxygen gas may be obtained in great abundance, in a very little time. This apparatus, which serves as a type for the constant piles, is formed of a phial filled with nitric acid, in which a glass tube is plunged, closed at the lower end with clay retained in the middle of a piece of linen, conveniently bound up, and filled with a concentrated solution of potassa; two plates of platinum are emerged, one in the acid, the other in the potassa, and communicating together by means of a platinum wire, whose free ends are twisted one over the other. As soon as the communication is established, an abundant disengagement of oxygen gas is operated on the plate immersed in the solution of potassa; this effect is due to the action of the current resulting from the combination of the acid with the potassa, and which acts with so much the more force as the stopper of clay is thinner. Plaster, moistened for this purpose, may be substituted for the clay.

At the time that I made known the apparatus, I announced that it might be usefully employed in a great number of cases, principally when it is required to present oxides in the nascent state to other bodies with which it is sought to combine them. My anticipations have not been deceived, as the Academy will be able to judge from the experiments whose results I now have the honor of laying before it.

In this apparatus, the nitric acid and, probably, the water are decomposed; the results of the decomposition are: oxygen in the tube containing potassa, and nitrous acid round the sheet of platinum steeped in the nitric acid. If it be wished to decompose water put in a separate vessel, it is sufficient to replace the platinum plate steeped in potassa by a plate of zinc, and to attach to the latter a platinum wire, at the end of which another sheet of platinum is fixed, and likewise to put one to the free end of the second wire. From the instant that the two plates are steeped in the water, the latter is decomposed; the plate connected with that which is in the potassa is the negative pole, and the other the positive pole. The disengagement of gas is abundant at each of them.

The following is what happens in the substitution of zinc for platinum: the former, being oxidised by the action exerted on it by the alkaline solution, takes the negative electricity; moreover, in the action of the acid on the alkaline solution, the latter seizes the negative electricity which it transmits to the zinc plate, so that when the circuit is closed, the current resulting from the reaction of the two liquids on each other, is added to that which arises from the oxidation of the zinc; but as this double effect is produced without the intervention of a new couple, and consequently without there being a new alternative, it follows that the current has a more energetic decomposing force than in the first case; the water is also abundantly decomposed in a vessel separated from the apparatus, although forming part of the circuit. It may, however, be proved that the water is likewise decomposed in the separate vessel, by using only the simple apparatus with platinum plates; for that purpose it is necessary to turn to account the property which the solutions of salts of lead possess of being decomposed when they are in contact with the positive plate of the voltaïc apparatus. In this case, the oxide of lead, passing to the maximum of oxidation, is separated from its acid and is deposited on the plate. If a salt of lead be dissolved in the water to be decomposed, the very small quantity of oxygen which arrives on the positive plate ordinarily prevents all ulterior decomposition, as M. De la Rive has recently proved; but here the gas is combined with the protoxide of lead, whence results peroxide of lead, which is precipitated, so that the cause which is opposed to the circulation of the current no longer exists. The brown tint which the plate assumes necessarily indicates the decomposition of the water; it is sufficient to put in the latter a solution of protoxide of lead in potassa. We are thence led to examine what takes place in the simple apparatus, by substituting for the solution of potassa the alkaline solution of lead; and, for greater simplicity, we replace the concentrated nitric acid by a concentrated solution of sulphate of copper, establishing the communication between the two liquids, by means of sheets of platinum; a short time after, according to the facility with which the current passes, the platinum plate in the potassa turns black, and is covered with an excessively fine layer of peroxide of lead, whilst the plate immersed in the sulphate of copper is not covered with copper in the metallic state. Hence it must be concluded that the current produced by the reaction of sulphate of copper on potassa by the intermedium of humid clay, decomposes the water; that the oxygen causes the lead to pass to the state of peroxide, whilst the hydrogen converts the sulphate of deutoxide of copper into the sulphate of protoxide, since hydrogen is not disengaged and copper is not precipitated for a long time on the negative plate. By operating with concentrated nitric acid, instead of sulphate of copper, the effects are changed, as will be seen.

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* *Comptes Rendus*, No. I., July 3, 1843.

OF THE HYDRATED PEROXIDE OF LEAD.

The tube is filled with the concentrated solution of potassa and protoxide of lead, nitric acid is left in the bottle, and the circuit is closed with the two platinum plates and the wire. The nitric acid is decomposed, the oxygen is carried to the plate which is in the alkaline solution, and, instead of being disengaged, it reacts on the protoxide of lead, and no longer causes it to pass to the state of puce peroxide, but to that of the yellow peroxide, and with formation of lamellae of anhydrous peroxide, according to the intensity of the current, always when the nitric acid is concentrated, and when the reaction of the acid on the alkali was brisk, a condition which is obtained by employing a not very thick partition of clay. The precipitate, at first of a fine canary yellow, assumes, after being well washed and dried, a tarnished and ochrey tint; dried *in vacuo* it always remains yellow, but its tint is not so fine as when it is in the potassa, sheltered from the light; it would even appear, that, when first formed, light acts on it. When it is very dry, if it be exposed to the action of heat, it begins to lose its yellow color towards 86° F.; and if we continue to raise the temperature, it is converted into puce peroxide of lead. Heated in a tube, the sides of the latter are covered with small drops of water; according to this, the new compound would appear to be only a hydrate of the peroxide.

The analytical results leave no doubt in this respect. 0gr. 179 of yellow precipitate, dried with care *in vacuo*, were strongly heated in order to be converted into puce peroxide; after which the weight was only 0gr. 165; thus 0gr. 14 of water had been lost. The 0gr. 179 of yellow precipitate therefore contained 0gr. 165 of peroxide of lead and 0gr. 014 of water. Now, as the weight of the atom of the peroxide is 1494·5*, and that of the water 112·50, it follows that 0gr. 165 and 0gr. 014 represent one atom of peroxide of lead, and one atom of water. Such is the composition of the yellow compound obtained, which is a hydrated peroxide of lead not hitherto described in chemistry.

The action of light appears to consist in causing this compound to lose its water of crystallisation, converting it into the anhydrous peroxide.

In order to prepare a certain quantity of this compound, the tube must be substituted by a cylindrical vessel of polished porcelain, in which the solution of potassa and protoxide of lead is put. The action may be favored by aid of a couple; but this must not be exceeded, if it be desired to avoid the formation of a great quantity of anhydrous peroxide: a condition indispensable to the success of the operation is, we repeat, to employ concentrated nitric acid, and likewise a concentrated alkaline solution of protoxide of lead. We shall see, further on, how the anhydrous peroxide of iron is procured: as regards the hydrated peroxide of manganese, the experiments undertaken with a view of obtaining it have been unsuccessful; but these experiments have enabled us to solve another question which will not, perhaps, be uninteresting to the arts, of covering metals with an unalterable layer.

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* In this paper, oxygen is reckoned = 100

ON THE APPLICATION OF THE OXIDES WITH ADHERENCE ON METALLIC SURFACES.

If the application of metals on other more oxidisable metals, in order to preserve the latter from the influence of atmospheric agents, has long occupied the mind, and if satisfactory results have been obtained in certain cases, what would be these advantages if for the less oxidisable metals were substituted the unalterable oxides, such as the peroxides of lead and iron, especially the latter, which is so fixed that it resists the action of a very high temperature! This question may now be solved by means of the above described apparatus, and by following nearly the same mode of experimenting as for obtaining the anhydrous and hydrated peroxides of lead. But, before indicating the necessary mode of operating, I will here mention that in the experiments which I made for collecting all the lead and manganese found in a solution, without a trace of them remaining, the peroxide of each of these two metals was deposited on the positive plate in layers formed of not very coherent parts, and not adhering to that plate, which should be of platinum or gold, in order to prevent new re-actions from taking place. In order to solve the question which I had put to myself, it was necessary for the deposition of the peroxide to take place with adherence not only on gold, platinum, or silver, which do not require to be preserved, but also on copper, iron, and other metals of more common employment, and which are often exposed to all the atmospheric variations. From the effects obtained in the first paragraph of this memoir, with solutions of protoxide of lead in potassa, I cast my eyes on the alkaline solutions: I had the choice only of solutions in potassa and ammonia. Now, among the oxides which potassa dissolves, we may mention the protoxide of lead, oxide of zinc, protoxides of tin and chrome, &c., whilst ammonia dissolves the protoxide of iron, the oxide of zinc and cadmium, the binoxide of copper, the oxides of nickel, cobalt, &c. I have occupied myself only with the solution of protoxide of lead in potassa, and that of protoxide of iron in ammonia, in order better to put in evidence the principle of the fixation with adherence of the oxides on metals, and to show the course to be followed for applying it to other oxides.

Let us commence with the solution of protoxide of lead in potassa.

200 grammes of caustic potassa were dissolved in two quarts of distilled water in a flask; 150 grammes of litharge were added to it; it was boiled for half an hour; the solution was left to settle; after which a cylinder of polished porcelain is taken, filled with the solution diluted with its volume of water. The cylinder was plunged into a phial containing water acidulated by about $\frac{1}{20}$ of its weight of nitric acid, in which was steeped a plate of platinum communicating with the negative pole of an ordinary constant voltaïc couple. The positive pole was connected with the piece to be covered with protoxide of iron. Let us suppose a plate of zinc, and see what happens. The plate, scoured dry, softened with a file and pumice stone, was immersed in the solution. A large quantity of hydrogen was immediately disengaged on the platinum plate, in consequence of the decomposition of the water and nitric acid. The oxygen, in passing to the positive pole, instead of oxidising the iron, changed the protoxide of lead into peroxide, which, attracted by the same pole, on account of its negative state, was deposited on the iron and adhered to it. A few minutes were sufficient for the plate to be covered with peroxide of lead, of a black color, having a slight brownish tint. The piece, withdrawn, dried by means of sawdust, bore polishing with English *rouge;* then the surface acquired a shining leaden black appearance. A plate of copper, substituted for the plate of iron, presented the same effects of color; the adherence was rather less powerful, but this was probably owing to the state of the surface. On silver plate, and especially on objects whose surface is slightly *rough* and covered with asperities, the adherence is stronger, and bears burnishing with the blood-stone. The color is jet black. Carved leaves were prepared in this manner, and mouldings burnished, without peroxide being detached. After 12 hours' duration of the experiment, when the solution is not changed, and when only very little protoxide of lead remains, the metallic surface is covered with a precipitate of peroxide of lead which has little adherence, and whose effect is such that it has the reflection of a fine black velvet. A small brass bust, covered with peroxide of lead and burnished, presented the appearance of a beautiful bronze. So long as hydrogen gas is disengaged on the platinum plate, the operation goes on well; when the disengagement ceases, it must be remedied by plunging the plate of platinum into nitric acid, to clean its surface, or by looking for the cause of the cessation in the voltaïc couple. This

cessation may arise from various causes: from *endosmose* having introduced protoxide of lead into the phial of acidulated water, from which results nitrate of lead, which is decomposed, or from the current having diminished in intensity. I wished to ascertain the point to which it was possible to deposit peroxide of lead on a pistol barrel whose surface had been cleaned with a file and pumice stone. The results were as satisfactory as could have been hoped: the surface of the pistol barrel acquired by means of leather and English rouge the lustre of iron plates. Experience will soon prove whether the barrels of fire-arms and other iron objects of general use can be preserved for a long time by this means.

It has been seen above that the surface of iron assumed a black appearance. If the action last a short time, the color of the precipitate is that of yellow ochre, which becomes deeper and deeper, and to which another tone may be given, as will be seen further on. Sometimes, with copper, a few moments after immersion, the surface presents variegated tints, owing to fine deposits, of which jewellers will perhaps avail themselves.

We now proceed to the deposition of peroxide of iron on objects of iron and steel.

The most simple means of preparing the ammoniacal solution of iron which should also be placed in an apparatus similar to that which has been described, is to make, with the aid of heat, a solution of protosulphate of iron, to place it, in order to remove from it the air which it contains, under an exhausted bell glass, and afterwards to keep it in a phial closed with emery. A certain quantity of this solution is poured into the porcelain cylinder, and then ammonia, previously deprived of air, is added, in little more than sufficient quantity for dissolving the protoxide of iron. The piece to be covered is then immersed in it, and put in communication with the positive pole of the couple; the solution is agitated with a tube, and the cylinder is closed to keep it from the action of the oxygen of the air, which would have a tendency to cause the protoxide to pass to the state of the peroxide. Notwithstanding all these precautions, some green oxide is always deposited, which it is impossible to avoid. From the time that the circuit is closed, there is a disengagement of hydrogen on the platinum plate, and the oxygen, passing to the object in the ammonical solution, peroxidises the iron, which is deposited with adherence by the same motive as that which determines the deposition of lead on the plate of copper; that is to say, because the protoxide of iron, acting the part of an acid with regard to the alkali, is attracted by the positive pole. But all the metals are not capable of receiving similar deposits: those whose oxides are soluble in ammonia should be excluded from it, such as gilded and silvered copper, because the oxygen transported oxidises the copper, either directly, or through the layer of silver or gold, and the oxide of copper immediately dissolving in the ammonia, it is no longer possible for the deposit to be effected. This is not all: a great part of the oxygen, being employed for oxidising the copper, cannot re-act on the protoxide of iron; but it is not the same with iron and steel which are covered with an adherent layer of peroxide of iron. A few minutes suffice for giving to the deposit a red-brown color, having somewhat of the appearance of precipitated copper. The deposit takes a polish when rubbed with leather and English rouge. When the surface has previously been suitably prepared, the deposit may be burnished like steel. A pistol barrel, a steel instrument, and various other objects, were covered with peroxide with like success. The red-brown color of the deposit is always the same when the plate remains a short time immersed; but, if the duration be greater, some remarkable effects occur, which I am about to describe with some detail, because they have relation to the different tints which peroxide of iron, more or less calcined, takes. It is known that sulphate of iron gives, by calcination, a fine red color, which becomes deeper when it is obtained from persulphate of iron, and blackish-brown when prepared by means of the deutonitrate of iron, whilst with the protonitrate by moderate calcination, we have a deep violet color which painters call *violet of Mars:* if the heating be carried too far, the ordinary red color of the protoxide is obtained. These variations of color cannot be attributed to the chemical composition of the oxide, for the quantity of oxygen in all these oxides is the same. It is evident, then, that molecular arrangement alone can account for it; but this is yet only a supposition. Now, as may be seen by looking at the plates which I present to the Academy, these same tints are found in the application of peroxide of iron, by operating with a single couple with a constant current, rendered active by moderately acidulated water. In the first instants this deposit has the red color; its tint becomes deeper and deeper, and after several hours it becomes deep violet. With two or three couples, it gradually turns black. The adherence of the peroxide diminishes, and there arrives a point at which the deposit is quite black and at which there is no adherence. The red deposits are unalterable in the air, whilst the very dark deposits are gradually converted into hydrated peroxide of iron no longer possessing cohesion. Now, what occurs by continuing the operation? There is a superposition of new deposits, and a transport of a great quantity of oxygen; it is, therefore, to these two causes that not only the changes of color, but also the changes in the state of aggregation of the deposited parts, must be attributed. These colored deposits, having the same appearance as the peroxides obtained by calcination, might be, indeed, combinations of peroxide and protoxide, which would be formed some time after the commencement of the experiment, and whose existence would be only of short duration. The superposition of the deposits may also greatly contribute to rendering the tints deeper; but this is not the acting cause, since there is a molecular change.

The above observations should be taken into consideration by persons occupied with the application of the principle which I have just made known; as the red deposit is formed in a few minutes, they never run the risk of obtaining the black compounds, which have little or no adherence.

(To be concluded in our next.)

*** *We have given this valuable article in the division of* "CHEMICAL MANUFACTURES," *because the processes described are intended to be applied in the Arts.*

CHROMATYPE, A NEW PHOTOGRAPHIC PROCESS.

BY MR. R. HUNT.

WE are indebted to Mr. Ponton for the discovery of the first photographic process in which chromic acid was the active agent (See THE CHEMIST, VOL. I., p. 73). He used a paper saturated with the bichromate of potassa, which, on exposure to sunshine, speedily passed from a fine yellow color to a dull brown, giving, consequently, a negative picture. M. E. Becquerel (See THE CHEMIST, VOL. I., page 151), improved upon this process, by sizing the paper with starch, applying the bichromate of potassa, which enabled him to convert the negative picture into a positive one by the use of a solution of iodine, which combined with the starch in those parts on which the light had not acted, or only slightly acted, forming the blue iodide of starch. These pictures are, however, tediously produced; they are seldom clear and distinct, and failure too frequently attends the utmost care.

While the author was pursuing an extensive series of researches on the influence of the solar rays on the salts of different metals, he discovered a process by which positive photographs are very easily produced. Several of the chromates may be used in this process; but Mr. Hunt prefers those of mercury or copper, the most certain effects being produced by the latter chromate, and, indeed, in a much shorter time than with any other of the chromates.

The papers are prepared in the following manner:—

Good writing paper is washed with a solution of the sulphate of copper and partially dried; it is then washed with a solution of the bichromate of potassa and dried at short distance from the fire. Papers thus prepared may be kept for any length of time, and are always ready for use. They are not sufficiently sensitive for use in the camera obscura, but they are available for every other purpose. An engraving—botanical specimens or the like—being placed upon the paper in a proper photographic copying frame, it is exposed to sunshine for a time, varying according to the intensity of light, from five to fifteen or twenty minutes. The result is generally a negative picture. This picture is now washed over with a solution of nitrate of silver, which immediately produces a very beautiful deep orange picture upon a light dun colored, or sometimes perfectly white ground. This picture is quickly fixed by being washed in pure water and dried.

The author remarked that, if saturated solutions were used, a negative picture was first produced, but if the solutions were diluted with three or four times their volume of water, the first action of the sun's rays was to darken the paper, immediately upon which a very rapid bleaching action followed, giving an exceedingly faint positive picture, which was brought out in great delicacy by the nitrate of silver. It is necessary that pure water should be used for the fixing, because the presence of any muriate damages the picture, and hence arises another pleasing variation of the chromatype. If the positive picture be placed in a very weak solution of chloride of sodium, the images slowly fade, leaving a very faint negative outline. If it be taken from the solution of salt and dried, a positive picture of a lilac color may be produced by a few minutes' exposure to the sunshine. Prismatic analysis has shown that the changes are produced by a class of rays which lie between the least refrangible blue, and the extreme limits of the violet rays of the visible prismatic spectrum—the maximum darkening effect being produced by the mean blue ray, whilst the bleaching effect appears to be produced with the greatest energy by the least refrangible violet rays.

NEWLY DISCOVERED MINE OF MANGANESE, NEAR GIESSEN.

We have been informed that manganese of very superior quality has recently been discovered in the neighbourhood of Giessen. An assay made by M. Barruel has been forwarded to us, which very satisfactorily proves its superiority. Professor Liebig always uses it in his laboratory, and speaks very highly of it. It has also been analysed by Dr. Ettling. We expect to receive a sample of it very shortly, and will immediately perform and publish an assay of it, in order that our readers may be enabled to judge of it for themselves, and to avail themselves of the advantages which it offers. We understand that it can be very economically imported to England.

IMPROVED ARRANGEMENT OF BLOWPIPE AND LAMP.

Mr. Glass has exhibited to us his improved blowpipe and lamp. It is extremely well adapted for the ordinary glass-blowing operations of the laboratory. Mr. G. is an exceedingly skilful operator with this instrument, and informs us that he finds it invaluable for the preparation of all glass tube apparatus. He prepared some test tubes in our presence by means of it.

The blowpipe is fixed at the required distance and height from the flame by means of two screws, one on the top of the lamp and the other at the back of the blowpipe, as will be shown by the cuts, by the adjustment of which, and the depression or elevation of the wick, flames, as in Figures 1 and 2, may be produced by the action of the mouth alone, both the hands of the experimenter being left entirely unencumbered and at perfect liberty for the manufacture of glass tube apparatus and all other blowpipe experiments. One hundred grains of pure silver supported on charcoal may be fused with facility by the pointed flame.

The wick-holder of the lamp is a decided improvement, for the wick is large, having a surface of one inch and a half by an inch—is not compressed—and always resting on the bottom of the lamp allows the capillary action of the fibres of the cotton to take place with freedom, thus keeping it amply supplied with oil, and preventing it from crusting. When raised to allow a large flame, it is used without the blowpipe for bending tubes.

The whole is a very simple and effective piece of apparatus, cheap, easily manageable, not liable to become deranged, and always ready for use—points of much importance to the practical chemist.

Mr. Glass recommends for its use the best sperm oil.

Fig. 3 gives a section of the brass nozzle of the blowpipe, full size, every one of which is carefully examined and tried by Mr. G. before it is fitted to the mouth-piece.

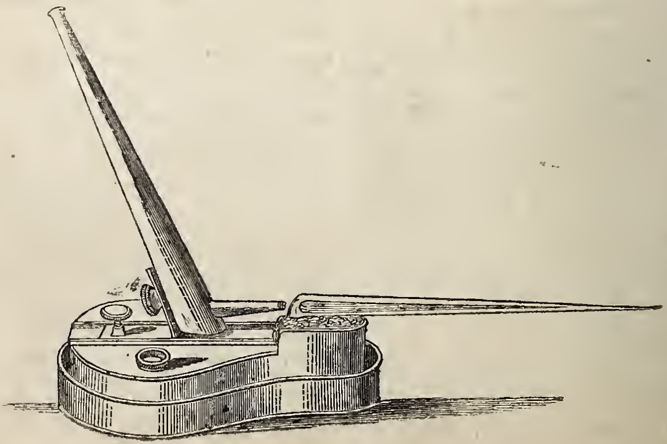

Fig. I.

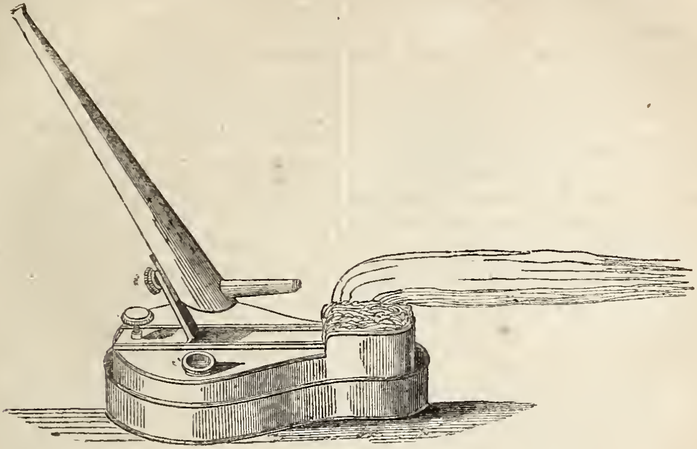

Fig. 2.

Fig. 3.

ON THE INFLUENCE OF LIGHT ON THE GROWTH OF PLANTS.

BY MR. R. HUNT.

The peculiar influence exerted on the germination of seeds and the growth of the young plants by colored light, has been for some years the subject of the author's investigations. The results show the surprising powers exerted by the more luminous rays in preventing germination, and in destroying the healthful vigor of the young plant. Plants, when made to grow under the influence of the red rays, bend from the light as something to be avoided; while the blue or chemical rays are efficacious in quickening the growth of plants.

Since the publication of the last Report, the author has tried plants of a great variety of kinds, and the same effects have been produced. It has, however, been found, that although blue light accelerates germination, and gives a healthful vigor to the young plant, its stimulating influences are too great to ensure a perfect growth. The strength of the plant appears to be expended in the production of a beautiful deep green foliage; and it is only by checking this tendency, by the substitution of a yellow for a blue light, that the plant can be brought into its flowering and seeding state. The etiolating influence of the green rays was observed upon, as well as the power which plants possess of sending out shoots of a great length in search of that light which is essential to their vigor.

SECOND MEMOIR ON MANURES.*

BY MM. BOUSSINGAULT AND PAYEN.

In our first memoir we endeavored to establish the comparative value of manures by the results of analyses. The practical observations which have since been communicated to us seem to justify the principles which we laid down as the basis of this estimation; at least, no serious objection has been raised, and the kindness with which enlightened practical men have received our former labors has induced us to complete our work by examining all the manures which it was possible to obtain.

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* *Annales de Chimie et de Physique*, Vol. VI., 1842.

For the more easy comprehension of the observations given in this second memoir, it will be sufficient for us to repeat the definition which we gave of powerful manures: now, as then, this definition appears to be the correct expression of well-proved facts.

"Manures are of so much the greater value as the proportion of nitrogenous substance is stonger and predominates in it, especially relative to that of the non-nitrogenous organic matters; that, finally, the decomposition of quaternary substances is gradually operated, and follows better the progress of vegetation."*

We intend here to define the value of manures applicable to cultivated lands, which contain the residue of previous crops—vegetable remains, poor in nitrogenous matter, but rich in ternary organic substances. It must, besides, be admitted with us, that intelligent agriculturists will be able to procure, with profit, and at low price, the mineral matters which may sustain the normal composition of the soil, and thus ensure the influence of manures.

In order that the manure spread on the soil might alone subvene to vegetable nutrition, it would be necessary for it to contain all the organic and inorganic elements which, without being derived from the atmosphere, would be, in the end, assimilated during the life of the plant, and contained in the crop. In this case, the manures should also vary according to the nature of the land, the climate, the season, the kind of vegetable cultivated, the exposure and inclination of the ground, and, finally, according to the influence of the subsoil and the residues of previous crops. If this hypothesis were admitted, the composition of manures ought to be so complex and variable that a general rule would be impossible; scientific data would be vain, for the required conditions could not economically be combined: it is therefore, convenient to divide, as has long been done, into two classes, the matters used for fertilising land: *inorganic compounds*, independently of the chemical properties which they communicate to soils by furnishing them with the mineral substances indispensable to the complete development of vegetables, evidently contribute to the improvement of the physical qualities of the soils in culture. Such are the salts peculiarly suitable for certain plants, as plaster for leguminous plants, those which occur in the greatest number of vegetables, substances with an alkaline reaction, as lime, potassa or soda leys, wood ashes, &c., which in general favor vegetation on all soils. These matters, so useful to agriculturists, are comprised under the denominations of *improvers* and *stimulants*.

We may regard, either as stimulants, or as manures, the substances by aid of which we are enabled to furnish to plants the water indispensable for their more productive development: organic remains macerated in pools, irrigations themselves, too frequently neglected where they are possible, serve to attain this important object.

Manures, properly so called, are of organic nature; they should supply, on the lands, the deficiency of *gasefiable or soluble aliments*, so that the vegetables may assimilate them.

Now, among these aliments, those were formerly erroneously considered the most desirable which could give rise to the most abundant production of carbonic acid. It was wrong, we repeat, for these are especially superabundant in continually cultivated lands, whilst putrescible nitrogenous matters, undergoing the most rapid decay, should, consequently, be most frequently added to the soil: it is always necessary to renew the provision of them, which is continually exhausted. They may then properly be pointed out to agriculturists as most worthy of attention, and if their proportions in the present manures be determined, useful information will be given, and the best means of detecting the frauds prejudicial to agriculturists relative to commercial manures will be given.*

It is now, moreover, a question judged by numerous concordant facts, and generally admitted by our most distinguished agricultural writers.

They also know that certain manures

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* It is therefore the *nitrogen in combination* in the substance that is especially useful, and its proportion that indicates the richness of the manure.

* The numerous disputes between agriculturists and merchants, relative to the disinfected manures and the black of refineries, have shown how illusory were the old processes of testing their value: the estimation of the nitrogen is very advantageously substituted for them: it is adopted by M. Malaguti, one of the learned professors of the Faculty of Rennes, not far from the localities which have derived such profit, in agriculture, from an extensive application of these manures.

Thus commences the realisation of a wish expressed by M. de Michel, and taken into consideration at the last meeting of the General Council of Agriculture.

furnish at once amendments, stimulants, water, and more or less nitrogenous organic aliments: such are most dungs, which, on account of the multiple functions they fulfil, should be appropriated to the soil and to special cultures: *fresh* for dry and sandy lands; *hot* for argilaceous, humid, and cold soils.

As regards rich manures, transportable to greater distances, they may be beneficially applied to all lands, for all cultures, provided that this action be favored, and that the power of the soil be developed by amendments, and irrigations obtained on the spot or not far from it.

In order better to fix the ideas on this subject, we quote an example which we have mentioned elsewhere: on a dry, sandy soil, to which dung thoroughly impregnated with water was perfectly adapted, it was attempted to replace this manure by dry blood, of equal value; the result is easily foreseen: the crop failed.

Should it be concluded from this that a manure rich in powerfully nitrogenous matter is useless or injurious on a light soil? No, without doubt; for such a manure, mixed in small proportion with fresh dung, so as to contain, in the total, the same equivalent of nitrogen, rendered the vegetation finer and the crop more abundant than in the ordinary culture, in which fresh dung alone was employed.

It is thus that green manures, or simple irrigations, ensure the efficacy of hot dungs on sandy and dry lands.*

The nature and value of the indications which may be drawn from our analysis being thus well defined, we will add some particular observations on the matter comprised in this new work.

Autumnal Leaves.—We have purposely selected the period when the leaves spontaneously fall to the ground: then, indeed, commences the part which they accomplish as manure; afterwards a fixed term of their decomposition cannot be determined.

Among the forest species, the leaves of oak and beech are of equal value; they represent at least three times their weight of normal dung, and we may even comprehend in this: 1. The amelioration operated in the superficial layers of the soil by the detritus of leaves in general. 2. The injury which may result from the removal of these leaves. 3. The profit which might be obtained by transporting this manure to soils which it would be important to commence fertilising.

The power of leaves as a manure is proved in Alsatia in all the Communes near forests; in such localities the cattle receive no other litter, and the latter, as analysis shows, is already a manure of a high value.

Madia sativa.—This plant seems suited to the economical preparation of a green manure; such, at least, was the idea of M. Bazin (of Méuil-Saint-Firmin, Oise), and the first results obtained will encourage new experiments.

In two months, in the favorable season, a land of good quality is covered with flowers. This was the period of manuring; it was at this time that M. Bazin sent us an average sample of the plants, roots, stems, leaves, and flowers. The whole, submitted to analysis, gave a strength rather exceeding that of farm-yard dung.*

The weight of the crop, estimated by M. Bazin at 1,250 kilogrammes per hectare, would be easily obtained, according to this agriculturist, in tolerable lands, if the year, being more wet, were more favorable than 1842 to the development of herbaceous plants.

Branches and Leaves of Box.—We analysed box with its young shoots, its stalks, and its persistent leaves, as it is cut in the South, according to the indication transmitted to us by M. de Gasparin; this manure may also be very simply prepared, by leaving it in the streets, exposed to grinding, by the feet of horses and the wheels of vehicles.

It will be seen by the numbers given in the table, that the proportion of nitrogen causes it to greatly resemble the leaves of beech.

Grounds of Cyder-Apples.—With several agricultural writers it still remains a question whether the grounds of apples may be considered as true manure, or, on the contrary, more injurious than useful: both opinions are founded on positive facts. In lands containing very little carbonate of lime, these residues have generally produced a bad effect, and, in other soils, disadvantageous results have always been observed when the grounds of apples have been found alone, or mixed with very little earth, too near the roots of plants. This unfavorable influence appears to be owing to the *acid reaction* of the soluble part of these residues; and, indeed, if they be saturated with a sufficient quantity of ley to communicate to them a perceptible acid reaction, the apparent anomalies cease, and the useful effects of the manure becomes proportionate to the quantity of nitrogenous matter which it contains; the liquid with which it is impregnated, and which it very tenaciously retains, gives it the character of a fresh manure, more particularly applicable to sandy lands. In Alsatia, one of us manured for a long time, and with success, artichokes with the grounds of apples, associated with the grounds of grapes, in a very argillaceous and sufficiently calcareous soil. In most cases, the grounds, like all acid products, are correctly placed among manures, their acid principle being adapted for retaining the ammoniacal vapor.

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* Dried blood, which, in the manuring of fields of canes, in the colonies, produces such useful results, is so much the more appropriate to that special culture, as it is able to complete the nitrogenous aliments without introducing into the soil mineral salts, which are sometimes too abundant in other manures, and which would constitute a real obstacle to the extraction of the sugar.

* When this green manure is dried, its richness is 2½ that of madia, analysed after the production of the seeds.

Grounds of Hops.—This residue of breweries, which was formerly rejected everywhere, is now in use in many localities; it is calculated for dividing compact earths: it may be much improved by drying in the air, then mixing it with the litter of cattle; it then serves as an excipient for urine, and the increase of the proportion of nitrogenous matters is so much the more advantageous, as it reduces the proportion and influence of of the non-nitrogenous part of the organic matter. This increase of nitrogen may be calculated by taking account of the strength of urine in this respect.

Scums of the Defecations of the Juice of Beet-root.—These scums, obtained in sugar manufactories, are formed of albuminoïd substances, coagulated under the influence of temperature, and of an excess of lime: they have an evident alkaline reaction; the organic matter which they contain is more abundant in nitrogen than that of dung; in their re-action and chemical composition, they unite qualities favorable to plants; practical observations show that their useful effect answers to these theoretical indications: in the normal state, pressed, but still quite moist, 7465 kilogrammes represent 10000 kilogrammes of farm-yard dung.

The scums, on leaving the presses, have a plastic consistence, which is opposed to their being spread uniformly on land; to avoid this inconvenience it is necessary to allow the scums to dry until their mass becomes friable; they are then easily crushed under a vertical mill, and they are easily employed like other pulverulent manures.

In the season in which beet root sugar is generally manufactured (from the end of September to January), the desiccations would be slow and expensive; it is more economical to dilute the scum with sufficient water to obtain a thin pappy mass, which is easily mixed with dung, unless it be preferred to spread this matter with a scoop, like *Flemish manure.*

Slices of Beet Root treated by Maceration.—This residue, almost entirely exhausted of sugar by the process called *maceration*, is poorer in nitrogenous substance than the pulp leaving the presses, and it contains a much more considerable proportion of water; its strength as a manure would be only 0·022 of that of farm-yard dung. Its equivalent, represented by 4136, dung being 100, shows that it would be necessary to employ about 40 times as much for an equal surface of land. The practical experiments on a large scale, agree with the results of analysis; it is therefore necessary to reduce this residue to a smaller bulk, by expelling a portion of the water by a special pressure; even then it constitutes a weak manure, which, in general, the expenses of carriage render of little use.

Cakes.—Among those which we have analysed since the publication of our first memoir, it will be seen that the richest arise from the seeds of camelina, poppies, and nuts, which are nearly of equal quality; then come the cakes of hemp, of seeds of cotton, and of beech. The latter, which is very ligmous, is sometimes employed as fuel; the oily produce of beech is, moreover, very variable.

The extraction and purification of the oil of cotton seeds, constitute, in France, a new manufacture, which will leave a residue useful to our agriculture: its value, as a manure, would be about ten times that of normal dung, as the strength of these two manures indicates.

Dung of the Inns of the South.—We analysed it with M. De Gasparin, to whom we owe all the information concerning its applications; this manure arises from the excrements and litters of horses and mules, fed with hay and oats.

A sample was taken after it had been heaped up for a month, still warm, but sufficiently moist not to turn white; the straw which it contained was softened and crushed, but without sensible decomposition; it weighed, in this state, 660 kilogrammes the cubic metre, and 820 kilogrammes if strongly pressed; it contained 0·3942 of dry matter; this represents 0·725 if its weight of organic substance: the ordinary and fixed price of this manure is 1 fr. 30 cent. the hundred kilogrammes; this quantity gives to a cultivator an increase of product, estimated at from 2 to 5 francs, in watered lands, and only from 93 cent. to 1 fr. in dry sandy soils. This fact, which is highly worthy of attention, shows all the importance of conditions favorable to the effect of manures.

It will be remarked, finally, that the dung of the inns is evidently twice as rich as the normal farm-yard dung: this is explained both by the small proportion of water which it contains, and by the more substantial nourishment given to the animals which furnish it: it approaches the excrements of horses.

Guano.—Among the manures which we were unable to procure at the time of the publication of our first memoir, we especially regretted reckoning guano, whose favorable effects had been so well proved in practice. Since, then, this manure has been imported in considerable quantities into England; several large farmers have employed it on a large scale; we have received from our Minister of Agriculture, and from foreign correspondents, various samples of guano, and information concerning its employment; finally, some similar applications have been undertaken by us. In England, guano is used, previously mixed with a fourth of its bulk of pulverised wood-charcoal: this mixture appears to us adapted for facilitating its dispersion on the soil—an important condition in the application of rich manures. Moreover, many years ago, one of us indicated the use of porous charcoal; it consists in moderating the spontaneous reactions and in retaining a portion of the gases.*

The quantities employed per acre correspond to the mean of the equivalents found by our analysis; but nothing very precise can be concluded from the result obtained, for the proportions of nitrogen are different according to the localities from which it is derived, in those immense strata of excrements of birds: this, moreover, is a reason why merchants and consumers should have recourse to chemical analysis.

The guano, imported under the direction of the Minister, was found twice as rich as that received from the English farmers, even purified from some sandy particles: the latter presented a brick color and a decided odor of certain savage birds; the other, of a greyish color, exhaled a putrid odor.

Some agriculturists have obtained good results from spreading guano with the seed: it is thus employed in Peru.

The effects obtained in several cultures have already raised the price of this manure even beyond that which its theoretical equivalent would assign to it.*

A great analogy of composition and effects may be remarked between guano and *colombine,* whose strength is intermediate between the two qualities of the imported manure.† Pigeons' dung is sold, in the department of Vienua, at from 3 fr. 75 c. to 5fr. the hectolitre, weighing 40 kilogrammes; it costs more to the agriculturists of Lille, who obtain it from the environs of Arras, and well know how to appreciate its good effects.

Litters and Chrysalises of Silk-worms.—These are residues which, until recently, were generally thrown away in the neighborhoods of *magnaneries* and *filatures,* where they could only be injurious on account of their putrid emanations.

They are now employed as manure, and we should call to mind, in this respect, what we have said of the advantages realised by disinfecting certain putrescible manures by means of charcoal.

The strength of the litters of caterpillars of the *magnaneries,* during their fifth and sixth ages, moreover, the most abundant, are almost identically equal, and their strength is nine times higher than normal dung.

As regards the chrysalises, they represent only five times their weight of farm-yard dung, because we analysed them quite humid just as they came from the cocoons; when dried they are wrth as much as most manures of animal remains.

Urine of Man.—It is known that the composition of this liquid is very variable, especially according to the alimentary regimen, and the quantity of drink in a given time. To obtain an average, we took our samples from the reservoir, promptly filled, of the public urinals of a very much frequented place. Two analyses of samples at a day's interval, gave us very similar results.

It is evident that in the ordinary state urine would represent nearly double its weight of ordinary dung, and that the dry extract of urine would be equivalent to forty times it weight of the same dung. Urine diluted with four volumes of water, then, employed in irrigations some time before sowing the seeds, penetrates into the soil, which, by its porosity, retains, sufficiently well, the volatile ammoniacal products.

But, when it is necessary to keep in reserve the urine separated or mixed with dung, it is requisite to stop the too easy loss of carbonate of ammonia. This is economically effected by dissolving sulphate of iron in the urine, when it can be obtained at a low price. From 6 to 7 kilogrammes per 100 kilogrammes of normal urine are sufficient. It is necessary to avoid adding much more of it than is equivalent to the carbonate of ammonia, for a decided acid re-action would be the result, which would be especially injurious to calcareous soils.

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* See the article *Disinfected Manures,* of our first memoir, THE CHEMIST, No. XLII., page 271.

* It is said that the Peruvian Government has just prohibited the exportation of guano.

† See THE CHEMIST, Nos. XLIV, p. 364, XLV., p. 409.

Black of Refineries.—This manure, sent from the refineries of Paris into Mayenne, gave rise to disputes between the seller and buyer: testing by simple incineration seemed to justify the complaint; it was necessary to resort to analysis which proved, on the contrary, both as regards the proportions of nitrogen, or the composition of the ashes, that there had been no fraud, for it was deficient only the quantity of water evaporated during the carriage: the manure was then rather more rich than on leaving the refineries.

Dutch Manure.—Under this name, is sold to the agriculturists of the neighborhood of Lyon, a pulverulent substance, which analysis showed to be identical with the disinfected manure called *animalised black.* (See our first memoir, THE CHEMIST, No. XLII., p. 271.

Blood Manure.—At the present time, there is prepared in England, blood, solidified with 0.035 of lime, mixed with 0.12 of very fine charcoal or soot, then dried. This mixture, made in the same manner as some of our pulverulent disinfected manures, is from five to six times richer than the black of refineries, but it disengages a putrid odor.

Residue of Prussian Blue and Blood.—This mixture is also an artificial imitation of the black residues of the refineries. Its strength is as high. The small quantity of carbonate of potassa left in the carbonaceous substance gives a slightly alkaline reaction, which must be favorable to vegetation.

Animalised Marine Plants.—This manure is prepared in the environs of Marseilles. The two samples which we received, one from M. de Gasparin, the other from M. de Pommier, director of the Echo, gave us sensibly the same results, which brings its strength to six times that of normal dung.

⁂ *The tables completing this memoir will given in our next.*

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ON MEDICINAL EXTRACTS.

BY G. M. MOWBRAY.

(Continued from page 415.)

How frequently has it been observed that when habituated to any particular process or manufacture, it becomes so easy in our hands that we look with reserve on any other that is offered to our notice: true it is, there are those in this mundane world to whom novelty alone is a sufficient recommendation for any process; but these are experimentalists, exceptions to the general rule, and exist in about the same proportion in every-day life as the visionary schemer does to the sober-minded and experienced man of business, or as the honest man does to the poor one. In this latter respect, by the bye, we have been compelled to reconsider the opinions inculcated by certain worthy schoolmen.

Our ancestors—worthy souls, how have they been abused!—were in the habit of preparing extracts by evaporation over the open fire; this method was improved in a very Hibernian fashion by the open water bath, as in the case of a Wedgewood pan adapted over a vessel containing water. I am decidedly of opinion that, by the shallow flat-bottomed pan (Fig. 1), and by constant stirring over a moderate fire, a better extract may be procured than by the interposition of water and a Wedgewood vessel (Fig. 2), owing chiefly to the rapidity which obtains in the former case. The changes effected in extracts having been attributed to the combined influence of the atmosphere and heat, it was first proposed by Berzelius, that the evaporating vessel should be covered in, and the liquid contents reduced to the extractiform state by *distillation* (Fig. 3). This method has the advantage of yielding a very good extract, and the process is conducted with far greater rapidity, *ceteris paribus,* than when the open pan is employed.

The next plan that has been proposed is the removal of the atmospheric air, first by

Barry's process—that is, by removing the air from certain refrigerators by the introduction of steam, cutting off the communication from the boiler, and also from the atmosphere, and then condensing the steam so introduced, by either a stream of cold water on the outer surface of the condenser, or, as adopted in some of the beet-root sugar refineries in France, by the injection of a jet of cold water into the interior of a large condensing vessel.

The next process* for removing the atmospheric air, is that which was introduced by Howard into our sugar refineries: in this case an air pump is employed to attain the end proposed, by the continued action of which not only is the atmospheric air, contained in the vessel in the first instance removed, but the leakages of manhole, joints, &c., &c., are during the process kept under, so that the process is uniformly conducted, and unvarying results may be attained. These methods of preparing extracts by evaporating with removal of atmospheric air, have been termed evaporation *in vacuo*, a term undoubtedly inapplicable, since although the atmosphere is by the air pump extremely attenuated, yet it cannot thus be entirely removed, whilst, on the other hand, as shown by Dalton, even where the atmospheric air is entirely removed as in the torricellian vacuum of a barometer, by the introduction of one drop of water on the surface of the mercury, the *vacuum*, strictly so speaking, is immediately (according to Daniell, with the rapidity of a ball from the mouth of a cannon) destroyed by the evaporation of the liquid, and the quantity of vapor is in exact proportion to the temperature of the liquid. However, since custom has sanctioned the term "*in vacuo*," so be it, and in the following observations I must be understood as bowing to her authority.

In the Pharmaceutical transactions for Oct., 1841, and also in the transactions for April, 1843, there will be found wood engravings of apparatus for preparing extracts, and indeed adapted for the general purposes of evaporation at a low temperature. It is to the first of these arrangements—drawn, it will be observed, on reference, to a scale of half an inch to the foot—that I would apply a few observations. On measuring the air pump of the drawing, it will be found to describe a barrel of 4 inches diameter, and a similar admeasurement of 4 inches between the centres of the crank indicates a throw of 8 inches. There is then a *powerful* objection to this arrangement, to wit, the power required to work such a pump, for in order to keep up continuous action (without which the barometrical indicator rapidly recovers its equilibrium), and to attend to the boiler which furnishes steam to the external surface of the inner pan, the exertions of two men (*and a boy?*) constantly employed, will be requisite; in verity, one man could not keep such a pump in full play, if accurately fitted, for ten consecutive minutes, and the labor for two men alternating, will be found exceedingly heavy work.

Mr. Redwood informs us that it usually takes from four to six hours (thus allowing a range of 50 per cent.), to evaporate 15 gallons of liquid with such an arrangement. Let us then calculate the cost of preparing an extract, and in order that we may do so with impartiality, we will assume certain data furnished by the journal to which I have referred.

112lbs. of henbane (worth 20s. per cwt., 1842) will yield, according to Mr. Squire, 59½lbs. of juice, furnishing 16lbs. 11oz. of extract.

Cost of manufacturing extract of henbane *in vacuo*, by manual labor:—

Diameter of pan, 3 feet; depth, 10 inches; contents, 25 gns. imp.

	£	s.	d.
Two men, half day each, pressing, at 3s. 6d. per diem each..	0	3	6
Two men, one day each, working pump..................	0	7	0
Firewood, coals, &c., ...	0	2	3
	0	12	9
Use of hydraulic press and vacuum pan, with superintendence, engineer's expenses, one day..................	1	1	0
Three cwt. of henbane at 20s..........................	3	0	0
16¾lbs. of extract at 5s. 7d. per lb......................	4	13	9

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* Next, so far as concerns its introduction to the Pharmaceutical world, but as this portion of the community have been considered somewhat behind their neighbors, not only in closing their shops and giving good salaries and diplomas to qualified assistants, so Barry's subsequent failure was introduced first to druggists as an improvement on Howard's method, although it never made its way with manufacturers.

The above estimate does not include the profit of the wholesale druggist or middleman, and it is utterly out of the question to suppose the merchant would lay out his capital upon a speculation, where such elements of risk as thermometers, stuffing boxes, barometer guage, 25 air-tight joints, air-tight manhole, and not less than 5 steam-tight joints, intervene between having procured the herb, and placing the extract on the wet counterman's shelves; therefore it could only be carried on by a manufacturer who, of course, would never venture to attempt competition with the wholesale druggist, but who must afford such druggist a fair remuneration for risk of bad debts, travelling expenses,* dispensing, &c.

The best workman in London could not make such an apparatus maintain its vacuum for 20 minutes together—I speak from experience; and, therefore, it is quite necessary to have continuous pumping in order to keep down the leakage; besides, the moment the action of the pump is suspended, the point of ebullition rises until it attains the same temperature as the medium by which it is being heated. The sugar vacuum pans having a diameter from 6 to 8 feet, whose cost varies from £500 to £900, require steam power equal to 2 horses, to work their pumps, the diameter of such pumps usually being 10 inches with a throw of about 20 inches, and here the vacuum seldom surpasses 26 inches when in full work. A pan of 8 ft. 6 in. diameter, jacketed in the usual manner, with a coil of steam-heated pipe, introduced within the pan, aided by two such pumps as those described, with plenty of cold spring water for condensation, will evaporate 1,200 gallons of liquid per diem. My object in throwing together the above remarks, is chiefly with a view of explaining why this complicated apparatus has not been introduced into our laboratories; practically it requires such perfection of apparatus, and is so expensive, that any attempt to bring it within reach of the retail druggist by a winch arrangement and manual labor, must inevitably cause disappointment.

Fig. 4. is a drawing of what will be found a somewhat more useful, but still more costly arrangement than that described by Mr. Redwood. On examination it will be seen that the vacuum is obtained and kept up by two air pumps, whose pistons are attached to the crosshead of a steam-engine; these pumps are double acting with metallic valves; the vapor arising from the pan is not condensed by a jet of water introduced within the main, but by the application of cold water to the surface of a condenser consisting of two caps, each of whose diameter is 2 feet, and depth 10 inches; these caps are connected with each other by 12 tubes each 2 inches in diameter, and about 6 feet long. By this arrangement, spirituous liquids may be evaporated to the consistence of an extract, and the spirit obtained therefrom undiluted; the capacity of the *back* in which this condenser is placed, being about 550 gallons. The steam having performed its duty in the cylinder of the engine, is sent beneath the pan, and thus the labor of pumping is rendered comparatively inexpensive. The lower pan is the segment of a circle whose diameter is 3 feet, and versed sine 10 inches, having a content, therefore, of 25 gallons, and an evaporating surface of 254 superficial inches; now the diameter of Mr. Redwood's pan being 2 ft. 6 in., and the versed sine 1·05 inches, it follows that its contents are 15¾ gallons nearly, and its evaporating surface will be 229 superficial inches.

By working at a vacuum ranging from 24 to 28 inches, and sending the exhausted steam from the cylinder, where it has been exerting a force of 16lbs. to the inch, through the jacket, I have found, on the average, that the surface of 254 inches evaporates 5 gns. per hour, the pumps working from 35 to 40 strokes per minute, the thermometer ranging from 110° to 120° F. Then 254 : 5 :: 229 . 4.5; or 18 gallons should be evaporated (in the pan figured by Mr. Redwood) in four hours, and 27 gallons in six hours, instead of *fifteen gallons being readily evaporated in from four to six hours.* Doubtless this important difference chiefly arises from the very imperfect manner in which exhaustion of the atmospheric air is effected by manual labor, a difference in one case amounting to 20, and in the other cases to 80 per cent., according to which extreme of Mr. Redwood's limits may have been taken for the basis of our calculations. I may observe that the time required to obtain a vacuum with the above arrangement is fifteen minutes.

Having, then, described the working power of what may be considered a very perfect arrangement, as compared with the results usually obtained, I feel that I should be misleading those for whom this experience has been committed to paper, if I did not caution the operator, that, even with such a vacuum pan, he must insist on procuring a perfectly fresh plant, and producing the juice therefrom as rapidly as possible. My own practice, after much attention, has been to coagulate such juice, and to separate the sediment and coagulum from the thin liquid, and to place the former in vacuo exposed to the absorbing power of chloride of calcium *without heat*, whilst the latter is transferred to the vacuum pan and run off as rapidly as possible; the products are afterwards mixed most intimately: by this method, perfect results may be obtained, there is no boiling over in the vacuum pan, no decomposition of albumen, gum, or change in the tint of the chlorophylle: such extracts gladden the heart of the enthusiastic pharmaceutist.

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* I use this term advisedly, for indeed the quantities ordered by retail druggists, on an average, are so trifling, especially in town, that the term is applicable; I therefore earnestly recommend the retailers to stand forth as defenders of counter-practice, unless they resolve to remove the wholesale druggist from his present position in town trade—that of dispenser.

COST OF MANUFACTURING 16¾lbs. OF EXTRACT OF HENBANE IN VACUO, BY MEANS OF STEAM POWER.

Diameter of pan 3 ft., depth 10 in., contents 25 gallons, evaporating surface 254 in., power of engine half horse.

N.B. By external condensation the spirit may be recovered from spiritous solutions.

	£	s.	d.
Two men half a day each, pressing, at 3s. 6d.	0	3	6
One man five hours, tending engine	0	2	0
Firewood, coals, &c.,	0	2	3
	0	7	9
Use of hydraulic press, vacuum pan, steam engine and superintendence, for half a day	0	10	6
3 cwt. of henbane at 20s.	3	0	0
16¾lbs. of extract at 4s. 8½d.	3	18	3

Having thus described the apparatus, not omitting some of the difficulties which attend first efforts to bring into action what may be considered as merely a modification of well known apparatus, I may be allowed to observe upon certain strictures which have been made upon extracts thus prepared. It has been stated by Dr. Meurer, see *Chemical Gazette*, June 15, 1843, p. 433, "that pneumatic extracts of narcotic plants are of far less efficacy than those prepared in the usual manner," an assertion which shows how dangerous it is to write on a process we have not fully examined, or at least witnessed.

In point of fact, after the juice has been obtained, whether subsequently mixed *with* spirit and free from albumen, chlorophylle starch and gum, or composed of all these in the absence of spirit, by evaporating *in vacuo* we obtain the following advantages over the open air process:—

1. The process may be conducted with far greater rapidity.
2. The influence of the atmosphere is excluded.
3. The removal of the vapor occurs at a temperature varying from 100° to 120° F.
4. The liquid removed as vapor, whether water, spirit, essential oil, or essential principle, may be collected and examined.

Under these circumstances, the extract produced consists of the juice minus such contents as are volatile at 110° to 120° F. But when Dr. Meurer compares an extract whose normal liquor has been mixed with spirit, and the gum thereby precipitated, the solution farther coagulated by heat, and the coagulum removed, it is manifestly the reverse of ingenuous to compare such an extract weight for weight, with another, wherein all these products have been preserved. Compare an extract of the shops with an extract prepared *in vacuo*. The questions that suggest themselves with regard to the former are these:—Whither has the albumen departed? Where is the starchy fecula gone? Where has this sacharine matter been obtained? What chemical change has the chlorophylle sustained, that its bright green tint should have been converted into a brownish black? and these are the *quœstiones vexatœ* to be answered when we undertake the proximate analysis of an extract prepared in the ordinary manner.

In answer to Dr. Meurer's observation, p. 431 of the *Chemical Gazette*, "with respect to the lively green color of narcotic extracts prepared *in vacuo*, this proves evidently nothing, for it is owing to a coloring matter, chlorophylle, which is peculiar to all plants, and which, from its characters, belongs to the class of resins, and possesses, as is well known, no peculiar active property"—I may be allowed to remind Dr. M., that this coloring principle is very readily affected by heat, light, and the atmosphere, especially when all these influences act conjointly, and therefore, if a process can be adopted which does not affect even so sensitive a principle as chlorophylle, it is but fair to infer that certain other principles whose decomposition is less readily affected, will likewise remain intact and unchanged. The reader will smile when he finds that the absence of this very change of color, the existence of which Dr. Meurer declares as evidently proving nothing, is nevertheless seized upon by his *confrère* Dr. Baldenius, at p. 433 of the journal we have been quoting, as an argument against a process wherein such change is caused; thus commenting on the extracts (expressed juices mixed with spirit) of Mr. Bentley, Mr. B. remarks:—"If we were to admit that the expressed juices mixed with alcohol are not at all liable to spoil, then their color should remain unaltered," and hereupon he proceeds to argue that Mr. Bentley's method, founded as it is on the very system of preparing extracts lauded by Dr. Meurer, as surpassing those prepared *in vacuo*, must be rejected, because the easily changed tint of the chlorophylle vanishes by keeping.

Stand up, "*pp in vacuo*, your color is not worth a rush!" says Dr. Meurer:

"Take that, expressed juices; you've no color at all, at all!" exclaims Dr. Baldenius.

These are the criticisms which raise a contemptuous smile on the face of the sweating laboratory man, and render few the attendants at morning lectures in Bloomsbury-square.

If the green color does not in itself afford a proof that an extract is perfect, at least it proves that during evaporation the constituents of such extract have not been submitted to any very great change, otherwise the evanescent tint of the chlorophylle would have been the first principle to have lost its characteristic hue.

When the compilers of the *London Pharmacopœia* shall have taken a step in the right direction as regards extracts, by endeavoring to limit their bulk as much as possible to the active portions of the plant; when they shall have placed their finger on certain constituents, and shall have said—"We pronounce this inactive, we therefore bid you reject it; we announce this to be all-powerful, we direct you, then, to preserve it;" the plodding manufacturer will, as readily as the hypothetical scribbler, direct his efforts to the prepartion of extracts as unalloyed by extraneous inactive matter as may be, or confine himself, if desired, to the elimination of the active principle alone; but whilst instructions, founded upon observation of the powerful effects of the fresh herb, are handed to him in terms as follows:—

"Exprime succum dein in patinâ quam primum *non defecatum*, ad idoneam crassitudinem consume"—

Let me advise the purchaser of extracts not to despise the test of color, either because it is popular, or because Dr. Meurer says it proves nothing. That every doctor does not think so, the condemnation of Mr. Bentley by Dr. Baldenius may be instanced.

My remarks have extended to such a length that I must defer the consideration of spontaneous evaporation for a future number.

36, Paternoster-row.

ON THE USE OF MALT LIQUORS.

To the Editors of The Chemist.

GENTLEMEN,—

As the subject of alcoholic and malt liquors is one of national interest, it becomes important that all possible information respecting them be elicited; and as the discussion between "Medicus" and myself has reference more particularly to the latter, I shall confine my observations chiefly to them; in doing which, I will endeavor to be as concise as possible, and will also bear in mind your wholesome counsel appended to my last letter.

Malt liquors are stated to be beneficial, in consequence of their *nutrient* qualities. That they *do* contain nourishment, all admit; but the *kind* and *degree* deserve investigation. All who are conversant with the processes of malting and brewing, well know that by the former nutritive matter is diminished and saccharine matter increased, and that by the latter the nutritive matter is almost *in toto* rejected, while the saccharine matter at the rate of 50 per cent, is converted into alcohol and carbonic acid gas. The following are Dr. Thompson's comparative analyses of unmalted and malted barley:—

	UNMALTED BARLEY.	MALT.
Gum......	5	14
Sugar	4	16
Gluten	3	1
Starch	88	69
	100	100

We perceive, then, that, by malting, the most nutritive principle of the barley is very materially diminished in quantity, while the starch, sugar, and gum, receive a decided increase. But it must be remembered that sugar holds the lowest rank among nutrient vegetable substances, and can bear no comparison with the farina of wheat, or the hordeïn of barley, from which to a great extent it is derived. And, further, only *half* of the sugar thus produced remains in solution in the beer: the remainder, as just stated, being changed into carbonic acid gas and alcohol. Of the gum and starch I shall speak hereafter.

I must here observe that the gluten is the only principle in the barley which contains nitrogen; and when we remember its diminution in quantity and, connect with it the following physiological truth, I think it will more forcibly show the extreme detriment of malting to the nutritive qualities of the barley. Starch, gum, sugar, *fat*, and all other aliments destitute of nitrogen can *only* be regarded as *permanently* nutritive, when in conjunction with diets containing albumen and gluten. *Alone* they are incapable of supporting the lives of gramino-carnivorous tribes. Of this, the experiments of Magendie, who found that geese fed on gum died on the 16th day, and those fed on starch on the 24th day, are decisive proofs; it follows, therefore, that the sturdy ploughman, if kept upon fat bacon, would prove that substances destitute of nitrogen *do* exhaust the system. The calculation is that malting reduces the nutriment of barley 19 per-cent.

In reference to brewing, we may observe that after due maceration of the malt in water, at the proper temperature, the wort thereby formed consists principally of saccharine matters, starch, a small portion of gluten, and mucilage. We have shown in what way the saccharine matter is disposed of. Berzelius says that the action of hot water upon starch is not a true solution, but a gelatinization, and that only a small portion is actually dissolved; therefore, as beer is valued in proportion to its thinness, and as a large quantity of starch is separated both by suspension upon the grains, and by precipitation in the fining, the quantity of it that ultimately remains in the beer must be trivial indeed. The vegetable mucilage, or gum, which is more abundant in malt than in barley, is said to be the prime source of the nutritious quality of the beer. On this point I will quote from Dr. Paris. He says—"Hops constitute the most valuable ingredient in malt liquors. Independent of the flavor and tonic virtue which they communicate, they *precipitate*, by means of their astringent principle, the *vegetable mucilage*, and thus remove from the beer the active principle of fermentation." The nutriment, then, that the beer *does* contain must be derived from its saccharine matter and gluten. The nutritive power of the former we have shown to be very weak, and the quantity of the latter must necessarily be very small. The evaporation of a pint of beer of good average quality will leave about 1 oz. of deposit, and this after being roasted and scalded is surely not worthy of a comparison, in point of purity and strength, with the original farina of the barley. He, then, who swallows beer for nutriment, gets it in only homœopathic doses.

Having shown the impolicy of using malt liquors as nutrients, we will now proceed to consider how much commendation they deserve as *stimulants*. Stimulants are either vital and necessary to life, such as air, heat, water, and nutriment, or medicinal and unnecessary to life. With reference to the latter, Dr. Pereira states that "they have no renovating action; but by causing reaction, give rise to exhaustion. Moreover, the so-called stimulants do not merely excite; most of them act as alteratives, and many of them by long continued use, or by employment in too large quantities, destroy life." Now, the most superficial physiologist in in Christendom well knows that the law of over-stimulation is, that the circulation falls off in a greater proportion than it is forced; whence arises the collapse, the depressed and sinking feeling which invariably succeed the use of artificial stimuli. It may be further remarked that with very few exceptions the repeated doses of these stimuli produce on the part of the animal economy an obtuse susceptibility to their influence, making it requisite to increase the dose in proportion to the length of time they are used. From this it appears, that before we can be in a *fit state* to receive these stimulants, we must be in a *diseased* state, and that if we employ them when in a state of perfect health, we not only produce unnecessary excitement, but also unnecessary *exhaustion*. Malt liquors are medicinal stimulants, and are stated to be beneficial in exciting the organs of digestion to action. Let us inquire upon what principle. Civilization is the result of science, not of accident; and it is this science that has brought us to our present artificial state, and has caused our aliments to be served up in all the variety of taste and style which culinary ingenuity has devised. Society, thus constituted, is said to be a strong proof of the validity of the above quoted argument in favour of malt liquors. But here observe, it is this very state of things that has induced us to select from the *Cruciferæ* our mustard and our horse-radish, and from the *Liliaceæ* our onions and garlics; we have also our saline condiment, and our *Aromatæ*. *They* warm the stomach and assist digestion; they prevent our vegetable food from running into the acid state, and our animal diet into the putrefactive. And where is there an English dinner served up without either one or other of them? What need, then, for the stimulus of alcohol, through whose agency Dr. Beddoes found that animals digested their food nearly one-half less, than similar animals from whom it had been withheld? Dr. Farrie also states that diluted spirits destroys as effectually, though more slowly, than the undiluted. Does it not appear, then, that malt liquors *even in moderation*, would ultimately do harm; that in digestion their stimulus is unnecessary? and it is an axiom universally held by medical philosophers, that whatever is *unnecessary* is *detrimental*. If it still be contended that malt liquors are desirable for the virtues of the hop, we state that these virtues are *medicinal*, not nutrient. Its value as a tonic, diuretic, and sedative is confirmed; but the *sick* need the physician, not those in perfect health, to whom, all along, our observations have applied. We are not so unreasonable as to deny them to the valetudinarian.

And the argument advanced in favor of the use of malt liquors is *experience*; i.e., knowledge derived from experiment, in opposition to theory or hypothesis. Universality of consent is not always the test of truth. Although millions are devotees of the Koran, it is no proof of its inspiration: in like manner, though millions of men have consented to the habitual use of wines and malt liquors, it by no means proves either their necessity or beneficial qualities. It may be presumptive evidence, but certainly is not *positive*. But millions of men have consented to *dispense* with the use of alcoholic beverages; men of all ranks—aristocrats, laymen, and paupers; men existing with animal food, and without it; some largely expending their physical powers, others their mental. The argument in this position has no more power than in the former; but it shows that men *can* do without them; and the statistics of crime give strong evidence that it is highly desirable they *should*.

With one or two more remarks I will conclude. Liberality of feeling towards the sentiments of others is one characteristic of a philosophic mind; and the man thus constituted will not malignantly impugn the *motives* of his fellow-men. Many who subscribe to the doctrines propounded in this letter are men of high and healthful moral feeling; and when it is sweepingly asserted that they adopt these principles for want of *self-control*, does it not indicate a state of mind repulsive and illiberal in the extreme? Self-denial for the good of others is a principle that has received the scorn and obloquy of men; *but* it has the sanction of a High Authority.

Upon the question thus discussed between "Medicus" and me, I again affirm that nothing has been advanced to make me waver in my original opinion; and as we appear mutually unable to convince, we must take leave of each other *sans changer*.

To me the evidence appears conclusive in favor of the abandonment of wines and malt liquors as our ordinary beverages; it would be well for those of your readers who think otherwise to come forward and espouse their sentiments. Principles that cannot stand every ordeal are not worth defending.

My last remark is, that unless we have an irresistible determination to cling to everything that has been proved, in spite of habits, prejudices, and authorities, reason is but a wise monarch with a nominal sceptre.

I remain,
Gentlemen,
Yours respectfully,
VIRTUTAS.

ON THE USE OF MALT LIQUORS.

To the Editors of the Chemist.

GENTLEMEN,—

I BEG to enclose you a portion of a lecture delivered by Baspail, the eminent physiologist, as given in the *Medical Times*, thinking that it may serve as an answer to your correspondents "VIRTUTAS" and "CHEMICUS," and save me trouble in answering the letter of the latter gentleman, whose communication appeared in the September number of your esteemed periodical.

"CHEMICUS" has taken a flight so far beyond common sense, that I really do not feel inclined to trouble myself with answering him particularly.

I am,
Gentlemen,
Respectfully yours,
MEDICUS.

"FERMENTED LIQUORS.—In the state of nature pure water is the best drink for every living being. Digestion when strong, and of a normal character, has no need of any other vehicle; and in hot countries, the peasant, as well as the traveller, finds in water, as a drink, the most delicious qualities, and which render it to him far preferable to wine. To his taste, water is the most delightful of all beverages, and wine is merely regarded as a medicine; and, indeed, in our state of civilisation, wine possesses no other character: it is a corrective to an imperfect digestion; it is an artificial addition of a certain quantity of alcohol, to a mass of aliment which is slow in producing it; for stomachs which are altered and deteriorated in consequence of civilization, are wanting in that energy, that vital influence which, in the man of nature, suffices of itself, without any artificial aid, in fulfilling the purposes to which it was destined. The inhabitant of the North has greater need of fermented liquors than the inhabitant of the South; as much because the cold depresses the functions, as that, transpiration being less abundant in climates with a low temperature, the alimentary mass gives up less quickly its aqueous particles, which serve as a vehicle to its fermentation. Wine holds the first rank among auxiliary drinks; then beer, provided it be well impregnated with hops, and this for reasons which we shall explain lower down. Beer, being less alcoholic than wine, and more loaded with carbonic acid, as well as with the glutinous and saccharine elements of digestion, is not only tonic, it is also nutritive; in drinking it, we make a kind of liquid meal. The kwass of the Russians is a beer made from rye, instead of barley. Cider and perry, less alcoholic than beer, possess an acidity which is not suitable to all stomachs, and require a habit for drinking them, which the inhabitants of Normandy have contracted from their infancy. Fermented liquors are not limited in their action to the alimentary mass; their excess passes into the current of the circulation; and they there produce, by the coagulating action of their alcohol upon the albuminous part of the blood, all the phenomena of intoxication. In fact, the tissues of the vessels assimilating to themselves the aqueous part of the blood, the alcohol thus concentrated acts with its full energy; and the coagulated albumen here and there intercepts the circulation. But this perturbation not being uniform, the antagonism which maintains us in a state of equilibrium is necessarily destroyed; the animal reels, being swayed to the right, to the left, behind, or forwards, according to the irregularities in the effects of the alcohol. The progress of intoxication increases within a certain time; and the debauchee, who rises steadily from the table, will probably fall down at a few paces distant, in consequence of the alcohol passing from the stomach into the circulatory system. The limbs become swollen, the flesh assumes a blue colour; for the coagulated clots in the capillaries resist the passage of the blood from the arteries into the veins; the stomachic membrane losing, by the action of the alcohol, the faculty of aspiration which maintained it in a state of humidity, remains inactive, and, as it were, paralysed; it repels that which it should attract; and all the muscular efforts, compressing this organ, assist it by their action in bringing on vomiting; a desirable result, which frees the man from the cause of his torture.

"There are not two ways of manufacturing fermented liquors; fermentation is a process *suigeneris;* every art which departs from it, is a falsification. The chemist may attempt, by synthesis, to recombine the products, which he believes to have isolated, by the analysis of wine; but that man whose stomach may be unfortunately subjected to such a chemical production will not be long in perceiving its evil effects, and thus becoming convinced that human art is ingenious in manufacturing poisons; while nature alone possesses the power of engendering nutriment. Alcohol, when super-added to water or to wine, never mixes with them, whatever we may do, in the same manner as in the process of fermentation; who knows whether the alcohol, which we obtain by distillation, exists originally under the same form as that presented to us in the receiver? However this may be, we find that our Parisian wines, the strength of which is increased by the wine-merchants who add eight or ten quarts of alcohol to the cask, are never so beneficial to the stomach as natural wine, even that of Suresnes. The stomach, in fact, quickly absorbing the aqueous part, sets free, with the same celerity, the alcoholic portion which was not combined, but barely mixed with the other; and this alcohol, being deprived of its water cauterises the mucous membrane, in the same way as rectified alcohol would do if swallowed at a draught. Some idea of the difficulty attending this subdivision of the alcohol in fermented wine, may be formed by the following fact:—After having placed in a stand a cask of good wine, say of 150 *litres,* divide it into three partitions of 50 *litres* each. If you analyse separately these products, you will find that the middle portion contains more alcohol than either the upper or the lower; does this arise from the fact that the capacity of saturation is in proportion to the mass, and that the middle partition has a greater capacity than the upper and lower partitions? I know not; but it is undoubtedly true that *connoisseurs* always take care to keep distinct, and frequently to use as a dessert-wine, the central third of their cask.

"If the change of water as a drink is capable of producing a degree of disturbance in our digestive functions, a change in the quality of wine acts with still more injurious consequences. Wine, in fact, acts either as a poison or as an auxiliary to digestion, according to the proportions of the mixture. Now, its action will depend on the habit of the individual; a wine which suits one drinker, will be too strong for a person of the opposite sex, or one who is not accustomed to drinking. Judge by this of the effect which must be produced on the Sunday upon the stomach of the poor mechanic, the drinker of water during six days of the week, by the alcohol which the distiller procures from potatoes, and which is diluted by the wine-merchant with pump-water on the Saturday evening, and hastily coloured with the myrtle-berry? You will also understand why the labourer of the south of France is scarcely ever drunk, whereas the mechanic of Paris rarely leaves the shop of the wine-merchant in a sober condition: in the south, the wine is excellent and cheap; everybody can procure it, and, consequently, it is never adulterated; the labourer is accustomed to it, and is never compelled, from the dearness of the product, to discontinue its use. A celebrated Academician, who depended on statistical figures alone, one day observed to his audience, to prove how much the morals of the people were corrupted, that, in the *Rue Mouffetard*, you met with a wine-shop every twenty steps; whereas, in the *Chaussee-d'Antin*, you scarcely found a wine-merchant at the corner of the streets. A mechanic who was present, replied: 'That this depended on the fact, that, in the *Chaussee-d'Antin*, every inhabitant has his celler, stocked with the best wines; while in the *Rue Mouffetard*, the people have no other celler than the wine-shop. But, in the *Chaussee-d'Antin*, every rich man consumes more, by himself, at a single meal, than a poor devil drinks in the course of three weeks.' The justice of this observation elicited the acclamation of the whole auditory, even including the Professor himself.

"Sobriety is a relative quality. That man is sober who eats and drinks no more than is necessary for him, at the same time that what suffices him would produce indigestion in another. I have seen beings pitiable in themselves, destitute of resources, and useless to society, who have been enabled to bear, with impunity, twelve bottles of wine a day; excess with them commenced beyond the twelfth. What manual labour could procure necessaries to such a habit as this? How happy would be that condition of society, in which every one could procure what is sufficient, and learn to be contented with that!"

JUNIOR DRUG CLUB.

WEDNESDAY, SEPTEMBER 6TH, 1843.

MR. WHIPPLE IN THE CHAIR.

THE CHAIRMAN, after having complimented Mr. Mowbray on the ability displayed in his paper, on Medicinal Extracts (see page 468), called the attention of the members to the propriety of inflexibly adhering to the formulæ of the Pharmacopœia, in opposition to the suggestions of a society (vide *Pharmaceutical Journal*), a practice fraught with consequences the most frightful; for by compounding prescriptions with the products of nostrums, the physician is disappointed, and the patient exposed to intense pain and anxiety. Mr. W. referred to the specimens introduced by Mr. Mowbray at the last meeting, viz. the lig. taraxaci and cinchonæ; preparations if it be possible, more vile than the concentrated infusions; but the cause of the circulation of those useless novelties, Mr. W. thought attributable mainly to those medical men who prefer color to quality. Mr. W. had met with men, who, notwithstanding it had been shown to them that *two-thirds* of a definite weight of green extract are inert, yet prefer its *solely* on account of its color. He added that if human life were not at stake, and "a green *and tough* extract" be required, the members knew the simple means of obtaining such a product.

Mr. Whipple, whilst contending for a strict conformity to the Pharmacopœia, admitted the formulæ of the Pharmacopœia for the extracts of gentian, liquorice, barks, &c., to be constructed in error.

In conclusion, Mr. W. seriously urged on the assistants the indispensable necessity of a cautious and careful habit; without such discipline the entire products of a laboratory are injured, and rendered objectionable.

JACOB "AGAIN."

"The new members—those who come in by examination—will tend to raise our professional character."—*Mr. Jacob Bell on the Prospects of the Pharmaceutical Society.*—"*Pharmaceutical Journal,*" *Vol. III., No.* 3.

AN avowal more offensive to the members and associates of the Pharmaceutical Society, as originally constituted, can hardly be conceived than the above. It may suit the purpose of the Editor of the Journal to fraternise with the inferior class of drugvenders with their 2 ounces of Epsom salts for three half-pence, and to avow the necessity of of raising his and their professional character, but if the effect of examination on members be to raise professional character, why, in Heaven's name, was not such a purifying ordeal imposed at the commencement? "Ye're a set of big blackguards, now i'faix; but we'll have some gentlefolk among ye shortly," is the humiliating confession of this good-natured fellow. It will never do, Jacob, never! a diploma bought and paid for at Bloomsbury Square will rank even below those of Heidelberg, Erlangen, &c.; besides, who would pay 2 guineas a year, or 20 guineas in one payment, for the *loan* of a diploma entitling him to M.P.S.G.B., when he may have for the same amount a trip up the Rhine, and the well recognised M.D. tagged to his name?

Look on this picture—
JACOB FUNK, M.P.S.G.B.,
and on this—
SIR CHARLES BELL, M.D.

Even Jenkins of the *Morning Post* has been known to acknowledge this truth; and surely his opinion, as a literary man, will have weight with Jacob.

Dress up the quack in what way you will,
The stamp of dispenser sticks to him still.

ONE WHO CAN DISPENSE WITH,
AYE, AND WITHOUT, A DIPLOMA.

ON PICKLING WITH PYROLIGNEOUS ACID.

To the Editors of The Chemist.

GENTLEMEN,—

THERE seems to be some prejudice existing against the use of this acid in the preparation of pickles, more particularly as imparting a very peculiar flavor to them: this may, however, be overcome in a very great degree by the addition of more spice: the advantages which this acid has over malt vinegar ought not, nevertheless, to be overlooked: it possesses a very desirable property—that of hardening or rendering crisp whatever is pickled in it, and that in a very short space of time compared with vinegar; it is also suitable where distilled vinegar is required, and moreover not more than one-fourth the price of the latter.

Although the London Pharmacœpia does not order this acid in the preparation of the liquor ammoniæ acetatis, yet I do not see why it would not answer as well as the acetum distillatum: it would, in fact, always be alike; whereas I have found the latter very often to contain traces of copper, evincing its having been distilled through a copper alembic.

There is no doubt of this acid being extensively used in the wholesale way, and although the pickles would not appear of so good a color (unless deleterious ingredients were used, which is often the case), yet its price and other obvious qualities, will, when better known, introduce it extensively also into domestic use.

I am,
Gentlemen,
Respectfully yours,
PATRIOTICUS.

Sept. 15, 1843.

ON GINSENG ROOT.*

BY M. CALAU.

THE Chinese name (*Gin-schen*) of the root and of the plant which furnishes it (*Panax quinque folium, L.*) signifies, according to the literal translation, *human forces*.

This long-lived plant grows wild in the *Mandchourie*, on the north of the Schantaun chain of mountains, in damp places: it reaches the height of from 33 centiemetres to 1 metre.

The root, consisting of a rhizanth, five or six centimetres long, somewhat resembles that of a carrot, with circular striæ of a brownish grey color. The stem is striated, without branches, and of a red color in the portion nearest the root.

The leaves, to the number of from four to six, have their petioles attached to the stalk, and dilated at their base, so as to present a sort of canal; they are composed and divided at their summit into five ovoïd folioles, of a pale green color, reticulated and serrated on the edges.

The flowers, sustained by elongated peduncles of a green color, are arranged in clusters: the calyx and the corolla are red.

The root varies in color according to the countries in which it is gathered. Thus, in the Corea, and in China, it is white, wrinkled in the dry state, and externally covered with a layer of pulverulen amylaceous matter; in Mandchourie, and in Dauria, on the contrary, it is yellow, smooth, and resembles yellow amber in appearance. The latter is considered more active than the former; and, on account of its rarity, is sold by the weight of silver. It has a sweetish taste, and is almost inodorous.

Roots are sometimes found which are divided into two portions, and which, for this reason, have been compared to the lower extremities of man: hence the Chinese denomination Gin-schen-gin (root resembling man). These roots, which are sold at the court of the Celestial Empire, belong exclusively to the Emperor, and are found in the possession only of high dignitaries.

The high price of this substance owes its origin to the superstitions of the Chinese: indeed, among that people, it is firmly believed that eternal and unalloyed happiness must reign in the houses of those who possess this root. At the death of the head of a family, it passes by inheritance to the eldest and most worthy of the surviving members.

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* *Gaugers's Repertorium der Pharmacie, &c., in Russland,* Vol. I.

The root of Ginseng should be carefully kept from the air, otherwise it very soon loses all its medicinal virtues. For this reason, as soon as it is extracted from the earth, it is placed in a vessel which is hermetically closed, after which it is immediately ried by exposure to heat.

In China it is regarded as an extremely strengthening medicine, and as capable of prolonging life; and the Chinese physicians administer it under the form of decoction, associated with chicken or mutton broth. The Chinese pretend that patients who are unable to leave the room on account of weakness, should be in a condition, after the administration of the first dose, to run a long race; and that a subject arrived almost at his last moment may, by this means, even have his life prolonged for five or six days.

IV. REVIEWS AND NOTICES OF BOOKS.

REVIEW OF THE CHEMIST IN THE MEDICAL TIMES.

We are seldom disposed to notice the vituperative animadversions in which our contemporaries, maddened by jealousy or soured by disappointment, may indulge. Fair criticism, be it in censure or in praise, on the part of those whose opinion we value, we should respect. The office of the critic, shorn of its rigid impartiality, is a disreputable and justly infamous one.

As journalists, it has always been our earnest endeavor to discharge our duty o; the public in such a manner as to merit the favorable opinion of our brother journalists: we have been successful in obtaining it to a greater extent than many of our more pretending contemporaries; and we feel an honest and proper pride in the handsome and liberal manner in which The Chemist has been reviewed in more than Three Hundred Periodicals in this country and in all parts of the world.

Lately, however, there has been an exception to this rule. The editor of a fourpenny journal, of small circulation, called the *Medical Times*, has twice thought proper to vent the ill-humor produced by want of success of this Journal. On the first occasion, making full allowance for the cause of his bitterness, we took no notice of the crabbed emanation from a fractious mind; we treated with good-natured contempt the paltry spite of our puny assailant. Now, however, that this ill-conditioned individual has again attacked us, we feel it may be necessary to remind him of his own littleness and to warn him of the propriety of a more strict adherence to truth.

In the first of these reviews the editor of the *Medical Times* calls Mr. Bell our "rival tradesman;" now, as we are not in the drug or any other trade, we are at some loss to understand the expression.

In the second, we are accused of having, in our September number, taken about "one-eighth of our matter from the *Medical Times*," without acknowledgement. To say that this is a wilful perversion of the truth, would be but telling the writer that which he already knows; in proof of its falsity, we have only to refer our reader to the number in question; they will there find that we borrowed five unimportant articles, namely:—"On the preparation of Hydrochlorate of Morphia," by M. Michiels; "On the Bebeeru Tree of British Guiana," by Dr. Maclagan (filched without acknowledgement by the *Medical Times* from our respectable and admirably-conducted contemporary, the *London and Edinburgh Monthly Journal of Medical Science)*; "Mercurial Ointment in Small Pox," by Dr. Stewardson, also borrowed by the *Medical Times* "without the frigid formality of an acknowledgement;" Dr. Schlesior, "On the Continental Treatment of Neuralgia;" and "Ammonia as an application to Bruises." The whole of these articles make but about three of our columns, instead of "one-eighth," or six pages, of our work. Our readers will perceive that these are the only articles the source of which was not acknowledged in the department of Pharmacy, and this may be explained as follows:—At the last moment, when we thought that we had supplied the printer with sufficient copy, he sent to us for more; as we were on the eve of leaving town, we immediately made some extracts from the *Medical Times*, and, in our hurry, omitted to append the usual acknowledgement.

We always feel some reserve, when taking articles from the *Medical Times*, in owning the source, as that journal is in the habit of taking from others without acknowledgement.

Some months ago, the Editor of this weekly miscellany having made very free with our articles (translated and communicated), we wrote to him on the subject, in preference to publicly exposing his disreputable practice, a piece of courtesy which he has not had the gentlimanliness to extend to our accidental negligence.

The Editor of the *Medical Times* is too much ashamed of his journal to step forward and publish his name to the world; he prefers making his invidious, vulgar, and cowardly attacks beneath the editorial veil; we, however, have a shrewd suspicion that Dr. C. J. B. Williams is the principal conductor; and everybody knows that a person named Healey, a lawyer, is the sub-editor. Whichever of the two wrote the review, the doctor or the lawyer, he will gain by it very little credit for veracity.

The *Medical Times* has long been a violent assailant of the *Lancet*, with very little success, however; for that journal, with all its faults, is still immeasurably the best conducted and most widely circulated of all the weekly medical periodicals.

We shall make but one extract from the *Medical Times* this month; and here it is:—

"*We shall next week give our* 'Students' Number'—*the last number of the present volume. It will consist of twenty-four pages, being a presentation of an additional eight pages to our readers, without increase of charge. The number will thus, for fourpence, contain more, and we hope better, matter than the* '*Lancet*' *and* '*Medical Gazette*' *present their readers for one shilling. Advertisements cannot be sent too early for a number the circulation of which will not, we anticipate, be less than* 7,000—*i.e., about three times the circulation of all the other medical journals put together. This will be a good time for subscribers wishing to take the new volume to enter their names. Our programme of the new vol. will appear next week.*"

We have no doubt that the writer of the above wishes it was as true as he would have others believe. How any man can have the audacity to state that the circulation of all the medical journals put together does not amount to one-third of 7,000 is most astonishing. Why, the *Lancet* alone has five or six times the circulation of the *Medical Times*. Does the Editor include the *British and Foreign Medical Reivew* in this estimate? Does he include THE CHEMIST and the *Pharmaceutical Journal?* Monstrous!

We intend shortly to review all the medical periodicals of the day, and in due course we shall come to the *Medical Times*, and we shall then show whether it contains "better matter than the *Lancet*."

LIFE ASSURANCE.

IT may have been seen that at a general meeting of the proprietors of the Britannia Life Assurance, the sanguine expectations of the directors have been fully realised, and that in the short space of five years upwards of four thousand policies have been issued. The success is to be attributed to the peculiar principles upon which this establishment is founded; amongst which is the novel one of retaining the profits as a double guarantee to the assured—a principle which ought to be more fully carried out, for it is the want of faith which in a great degree prevents those who are desirous of insuring, and thus providing for their families, from taking so necessary a course. It is not the habit of the journalist to allude to one society more than to another, but here the very novelty observed upon demands a passing expression of congratulation, and it is freely accorded to those who have assisted by their confidence the spirited projector of the experiment.—*Evening Paper.*

THE HYDRO-ELECTRIC MACHINE AT THE ROYAL POLYTECHNIC INSTITUTION.

AT the invitation of the directors of the above Institution, we attended at the private exhibition of Armstrong's Hydro-Electric Machine, on Friday, September 15, previous to the reopening of the Institution, which had been closed for about three weeks during the fitting up of this wonderful machine.

Mr. Bachhoffner demonstrated the extraordinary powers of the machine, and performed some very beautiful experiments. He exploded loose gunpowder, fired some dry shavings, and showed that a permanent but very trifling deflection of the galvanometer was obtained. He exhibited, also by its means, the *aurora borealis*, and showed that it is capable of doing all that the glass-plate electrical machine can, and of much that it cannot do.

The exhibition is a highly interesting one, and we have no doubt will prove highly attractive to the public. We understand that great numbers of persons have already been to witness it, and we recommend every one to embrace an early opportunity of doing so.

Among those present we observed Mr. Armstrong, the gentleman to whom we are indebted for the perfection to which this apparatus has been brought, and whose zeal we are glad of this opportunity of commending. Would that his example were more extensively followed!

BOOK RECEIVED.

Lectures on Polarized Light, delivered before the Pharmaceutical Society of Great Britain; and in the Medical School of the London Hospital. Illustrated by above fifty wood-cuts. London: Longman, Brown, Green, and Longmans. 1843.

TO OUR CONTRIBUTORS.

We take this opportunity of thanking those gentlemen who have kindly furnished us with the valuable communications inserted in the present Number, and we hope that their example will be followed by others of our readers, who may feel disposed to advance science by communications the results of well-directed experiments. We have promises of articles from several eminent men, and we hope by the insertion of such papers to increase the reputation of our work, which is by far the *oldest*, and we hope we may add, without vanity, the *best*, of the kind.

The circulation of The Chemist, in Great Britain and all over the world, has become so considerable as to convince us that it will occupy its present highly gratifying position for many years, in spite of the opposition of journals which are inferior to it as regards both the quantity and quality of the matter.

TO CORRESPONDENTS.

"R. T." answered in our next. If you will send your address, &c., you shall have a reply by post.

"A Subscriber, London." Accidentally neglected. In our next Number.

"E. E. N., Andover." We will write according to your request.

"A. G." will receive a letter.

Many other correspondents answered by post.

We have to apologise to some of our correspondents for having delayed to answer their queries; this has been caused by the great pressure of business attendant on the removal of our place of publication.

ERRATA IN No. XLV.

In Mr. Glass's Letter, page 402, col. 2, line 3 from top, instead of "regard," read "regarded." Line 11 from top, in formula, for "C^{14}," read "Cl^{4}."

Erratum in the present Number—For "Dr. Robert Bare," read "Dr. Robert Hare," col. 1, line 4 from bottom page 437.

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN AUGUST, 1843.

BY E. THOMPSON.

GENERAL SUMMARY.

BAROMETER.

Monthly mean . . .	29·76
Mean at 9 a.m. . .	29·74
Mean at 3 p.m. . .	29·76
Mean at 9 p.m. . .	29·78
Maximum on 12th .	30·18
Minimum on 22nd. .	29·25
Range	0·93

THERMOMETER.

Monthly Mean . . .	58°
Mean of Maxima . .	66
Mean of Minima . .	51
Maximum on 18th . .	79
Minimum on 21st . .	44
Range	35

WIND.

	Days.		Days.
N.	0	S.	1
N. E.	1	S. W.	7
E.	5	W.	10
S. E.	2	N. W.	3

RAIN.

2·90 inches.

WEATHER.

	Days.		Days.
Clear . . .	9	Continued rain .	2
Cloudy . . .	7	Mist	1
Overcast . .	0	Lightning . . .	2
Showers . .	10	Thunder . . .	2

GENERAL REMARKS.

The weather during this month, so important to the farmer and the country in general, has been upon the whole genial.

The temperature has been but 3 or 4 degrees below the average at the metropolis for this month.

Rain has fallen on 12 days, but the whole amount has not been very considerable.

The harvest in this part of the country has just commenced at the end of the month.

Nota Bene.—*All Communications, Books for Review, and Substances to be analysed, must be addressed "To the Editors of The Chemist,* 310, *Strand, London." Communications must be pre-paid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON THE ACTION OF SULPHUROUS ACID ON THE METALLIC OXIDES.*

BY DR. VOGEL, SEN., OF MUNICH.

Besides the gaseous combinations which hydrogen forms with phosphorus, sulphur, &c., we are also acquainted with several acids, not saturated with oxygen, of these same combustible bodies, namely, phosphorous, arsenious, and sulphurous acids, which have the property of reducing, at a low temperature, various metallic oxides.

The *modus operandi* of sulphurous acid on the metallic oxides is presented in several points of view; and, with regard to the changes which the oxides undergo, on the part of sulphurous acid, they may be divided into three classes:—

1. The oxides which are totally reduced to the metallic state by means of sulphurous acid:
2. The oxides which yield to sulphurous acid only a portion of their oxygen, passing to an inferior state of oxidation:
3. Finally, the oxides which undergo no reduction by contact with sulphurous acid.

Berzelius says, in the fourth volume of his *Treatise on Chemistry*, third edition, that the action of sulphurous acid on red oxide of mercury has not been examined, and he advances that a neutral protosulphate should result from their combination; this opinion induced me to make some experiments on this subject.

As phosphorus acid readily reduces several metallic oxides, it seemed probable that sulphurous acid would act more or less in the same manner, especially as we are already acquainted with the partial reduction of the salts of copper and iron by means of this acid.

RED OXIDE OF MERCURY.

When a concentrated solution of sulphurous acid gas in water is poured on well-powdered red oxide of mercury, the mixture is heated, the red color of the oxide disappears, and a light, white powder is immediately formed and slowly deposited. If, for example, a thermometer be steeped in an ounce of sulphurous acid at a temperature of 64° F., and if half an ounce of red oxide of mercury be added to it, the thermometer rises from 64° F. to 78° F. By filtering the liquid after some minutes' contact with oxide of mercury, potassa produces in it, indeed, a black precipitate, and common salt a white one; a certain quantity of protosulphate was at once formed by the first action of sulphurous acid, as Berzelius had predicted; the white powder acted the same as a protosulphate and a sulphite, for it was blackened by the alkalis.

This white powder, which is formed at the first contact of sulphurous acid with the red oxide of mercury, acquires a greyish tint by the addition of a larger quantity of sulphurous acid. The decanted liquid was acid, and contained an excess of sulphurous acid, plus mercury, but in the state of deutosulphate; there was no protosulphate, for the solution of common salt produced in it no precipitate.

By boiling this liquid, which still contained free sulphuric acid, a greyish powder of a metallic lustre was deposited, and the odor of the sulphurous acid had entirely disappeared. By adding to it a fresh quantity of sulphurous acid, and by heating it *de novo*, all the mercury was separated in the metallic state, and the decanted liquor contained nothing but sulphuric acid.

The change which red oxide of mercury undergoes is more striking, if the sulphurous acid which is poured on this oxide be boiled. In this case, and with a suitable quantity of acid, the whole quantity of oxide is immediately reduced to the metallic state, and the supernatant liquor consists of sulphuric acid, without any trace of mercury.

SALTS OF OXIDES OF MERCURY.

If, then, as we have just seen, red oxide of mercury may be reduced in a short time

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* *Journal de Pharmacie*, Sept. 1843.

N. S. Vol. I.—*No. XI. November*, 1843.

and completely, by means of sulphurous acid, especially by raising the temperature of the acid, it was easy to foresee that the same thing should occúr when the oxide is combined with an acid, which led me to examine the action of sulphurous acid on some salts of oxides of mercury.

A solution of deutonitrate of mercury became milky by the addition of sulphurous acid; a white powder was formed which acted like protosulphate and sulphite of mercury, and which gradually became grey by the addition of a greater quantity of sulphurous acid. At the end of twenty-four hours, finely divided mercury was found at the bottom of the vessel, but the supernatant liquid still contained mercury, notwithstanding the excess of sulphurous acid. By heating the transparent liquid to ebullition, it became turbid, and deposited the whole quantity of mercury which it contained. Therefore, according to that, all the oxide of mercury contained in the nitrate may be reduced, when the sulphurous acid put in contact with it is boiled.

I could not effect the passage of the deutoxide to the state of protoxide in the liquor containing an excess of sulphurous acid, for a solution of deutonitrate of mercury previously mixed with common salt and afterwards with an excess of sulphurous acid, did not immediately form calomel, but, at the end of a few days, the mixture contained in a flask began to become turbid, and deposited a white precipitate insoluble in water, susceptible of being sublimed, turning black with lime-water, as well as with ammonia, yielding to them hydrochloric acid; in a word, it was calomel which was formed in this instance.

As soon as the solution of deutonitrate of mercury was mixed with sulphurous acid, and, although the liquor contained much oxide of mercury, the latter was not precipitated by the alkalis in excess, which also happens by the addition of some other acids.

PROTONITRATE OF MERCURY.

If the solution of deutonitrate of mercury at first becomes milky by the addition of sulphurous acid on account of the protosulphate which is formed, as we have just seen, this same acid afterwards produces, in the solution of protonitrate of mercury, a blackish-grey precipitate. Notwithstanding the excess of sulphurous acid, all the mercury is not separated at the end of several days, and it is necessary to raise the temperature in order to completely reduce the last traces of protoxide of mercury. This prompt and perfect reduction always takes place when the mixture of protonitrate of mercury and of sulphuric acid is boiled.

CORROSIVE SUBLIMATE.

A concentrated solution of sublimate in water, mixed with double its volume of sulphurous acid, and placed in a flask, remained clear for some time, and began to become turbid the next day; but, as soon as the liquid was boiled, it became milky and deposited a white powder in considerable quantity. This precipitate, well washed and dried, did not contain sulphate, but it acted entirely like calomel.

The decanted liquor of the white precipitate still contained sublimate. By a greater quantity of sulphurous acid, and by aid of ebullition, all the sublimate was converted into calomel.

When twice its volume of sulphurous acid is added to a concentrated solution of sublimate, the oxide of mercury is not precipitated from this mixture by an excess of caustic alkali, and the clear and very alkaline liquid contains all the mercury in solution.

The same phenomenon takes place, to a certain extent, with a mixture of sublimate and acetic acid; an excess of caustic potassa does not at first form in it a yellow precipitate, the alkaline liquid contains mercury in solution, and it is only at the end of some time that a light, whitish precipitate is deposited. These circumstances seem to merit some attention in toxicological investigations.*

CALOMEL.

Calomel left for several days in contact with sulphurous acid, acquires a greyish tint; however, I could not distinguish in it metallic globules. The action is rather more powerful when sulphurous acid is heated with calomel. It then becomes of a deeper grey, and the decanted liquid contains free hydrochloric acid.

Calomel thus treated by sulphurous acid presented a homogeneous powder of a dark grey, in which I could not observe, even with the aid of the microscope, metallic globules. Heated in a glass tube, white calomel and a few metallic globules of mercury were sublimed, which made me consider this grey powder, not as a mixture of calomel and metallic mercury, but rather as a subchloride of mercury. Hence it is very difficult to reduce calomel to the state of metallic mercury.

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* M. Mialhe has recently mentioned the fact, that sublimate mixed with hydrocyanic acid is no longer visibly influenced by the alkalis.

As calomel, the least soluble of all the salts of mercury, yields more or less of its constituent parts to sulphurous acid, it was easy to foresee that no mercurial salt would perfectly resist sulphurous acid; I then, to terminate this series of experiments, also examined the action of this acid on turpeth mineral.

TURPETH MINERAL.

Subsulphate of oxide of mercury (turpeth mineral) agitated in a flask with sulphurous acid, was in great part dissolved, and the solution then became milky on account of the formation of a protosulphate. Carried to ebullition it became more turbid, the white powder which floated in the liquor became of a blackish-grey, was promptly deposited, and acted like metallic mercury.*

The liquid, decanted from the metallic deposit and evaporated, left only sulphuric acid without any trace of mercury.

As the reduction of oxide of mercury, as well as that of the sulphates and nitrates, is complete by sulphurous acid, with the aid of heat, I think that preference may be given to this acid over phosphorous acid, when it is required to accurately appreciate the quantity of mercury in toxicological investigations, for the preparation of phosphorous acid in considerable quantity presents some difficulties, which is not the case with sulphurous acid.

OXIDE OF SILVER.

As it is generally known that the reduction of oxide of silver is very easily operated, either by heat or by other means, I expected to be able also to reduce this oxide by sulphurous acid, which was not confirmed by experiment.

Oxide of silver, separated from the nitrate by means of lime-water, and still moist, was only very imperfectly reduced by sulphurous acid heated with it for some time. Sulphate of silver remained in the decanted liquid, notwithstanding the excess of sulphurous acid employed.

When sulphurous acid is added to a solution of nitrate of silver, a white precipitate is formed, which becomes greyish by boiling, and the liquid again becomes turbid on cooling. Nitrate of silver still remains in the decanted liquor, notwithstanding the excess of sulphurous acid. It is therefore difficult to reduce the silver in the nitrate of silver. Moreover, the metallic silver which is deposited, is almost always accompanied by a small quantity of sulphuret of silver, which renders this process unfit for reducing silver in order to procure fine silver; this mode of reduction by means of sulphurous acid is, therefore, less advantageous than that by protosulphate of iron, ordinarily employed in the arts.

I have not been able to reduce chloride of silver by means of sulphurous acid; it is true that this chloride, on being heated with sulphurous acid, acquires a light grey color, but I have not observed in it free silver.

OXIDES OF ZINC, ANTIMONY, AND URANIUM.

Flowers of zinc, heated with sulphurous acid, do not pass to the metallic state, nor to an inferior state of oxidation; this oxide is entirely dissolved in the acid, and the evaporated solution leaves a residue of pearly scales, which consist of sulphite of zinc, with some traces of sulphate of zinc.

The oxides of antimony and uranium in like manner resist the reductive action of sulphurous acid; there was very little antimony dissolved in the acid liquor; but the oxide of uranium was entirely dissolved, and sulphite of uranium was formed.

OXIDE OF COPPER.

When sulphurous acid was poured on black oxide of copper, which had been previously heated to a cherry-red, the reduction to the state of oxide was slowly operated; however, at the end of 24 hours, sufficient protoxide was formed for the decanted liquor to give a yellow precipitate with the alkalis. By boiling sulphurous acid several times, with black oxide of copper, it was converted into a brown-red protoxide.

It was known that the solution of sulphate of copper passes succinctly to the state of protosulphate by sulphurous acid; but the reductive action on the part of this acid is more powerful on acetate of copper. If we add to a solution of acetate of copper its volume of sulphurous acid, it immediately acquires an emerald green color, and potassa produces in it a yellow precipitate. By boiling the mixture, it becomes turbid, and the greatest part of the copper is deposited, in the state of a brown-red protoxide.

When we pour into a concentrated solution of acetate of copper, drop by drop, sulphurous acid, but not in excess, the liquor becomes green, and a yellow powder is deposited, which is redissolved in an excess of sulphurous acid. This yellow precipitate acts like a hydrate of protoxide of copper.

OXIDE OF IRON.

Red oxide of iron, previously calcined, is not reduced to an inferior state of oxidation by sulphurous acid; whilst this retrograde passage readily takes place with the salts of oxide of iron; the deutoacetate of iron espe-

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* When turpeth mineral contains a small quantity of protoxide of mercury, a more or less blackish mass is formed by the contact of sulphurous acid.

cially easily passes to the state of protoacetate when sulphurous acid is made to act on it for some time.

MOLYBDIC ACID.

Molybdic acid and the native molybdate of lead, heated to redness, are perceptibly reduced by sulphurous acid, only, when sulphurous acid is evaporated to dryness over well-powdered molybdate of lead, blue stains are observed, which may, however, be produced by the sulphuric acid which is formed; for it is known that if sulphuric acid be heated for some time over native molybdate of lead, the evaporated residue assumes the color of indigo.

By adding an excess of sulphurous acid to an alkaline solution of molybdate of potassa, the liquor acquires a blue color at the end of twenty-four hours. By boiling a mixture of a solution of molybdate of potassa, and an excess of sulphurous acid, it becomes of an indigo blue; this blue molybdous acid, resulting from the partial reduction of molybdic acid, may be brought to the state of perfect and colorless acid, by the addition of a small quantity of nitrous acid. I will not mention the partial reduction and passage to an inferior state of oxidation of the acids of chronium, arsenic, and manganese, the actions which sulphurous acid exerts on these acid compounds is very generally known.

SUMMARY.

From the foregoing experiments it results:—

I. That red oxide of mercury passes first to the protoxide, combined with sulphurous and sulphuric acids, and that it is afterwards completely reduced to the metallic state by sulphurous acid.

II. That deutonitrate of mercury is slowly reduced by sulphurous acid, but that the reduction becomes perfect with the aid of heat. The protonitrate of mercury is more easily reduced in the same way.

III. That corrosive sublimate is reduced, in the same circumstances, by sulphurous acid, only to the state of calomel, and that the solution of sublimate, mixed with a sufficient quantity of sulphurous acid, is not precipitated by the addition of an excess of the caustic alkalis; the mercury remains in solution in the alkaline liquor.

IV. That calomel is not reduced to the metallic state by sulphurous acid, but only to a subchloride of mercury; that the yellow deutosulphate of mercury (turpeth mineral) is entirely reduced by sulphurous acid.

V. That oxide of silver is not completely reduced by sulphurous acid, which may also be said of nitrate of silver.

VI. That the oxides of zinc, antimony, and uranium, do not undergo the slightest reduction by sulphurous acid.

VII. That calcined black oxide of copper, left in contact with sulphurous acid, passes to the state of brown protoxide, and that the deutoacetate of copper becomes protoacetate with the aid of heat; the greater part of the copper is deposited from it in the state of brown protoxide.

VIII. That calcined red oxide of iron yields none of its oxygen to sulphurous acid, and that deutoacetate of iron passes to the state of protoacetate.

IX. That molybdic acid is not reduced by sulphurous acid, but that molybdate of potassa is reduced to a state of oxidation inferior to the blue compound—to molybdous acid.

NEW MODE OF ASSAYING THE ORES OF CHROME.

BY CHARLES WATT, JUN.

It is a fact with which all chemists may not be acquainted, that nascent hydrogen is capable of decomposing chromic acid, reducing it to the state of green oxide, when a preponderance of any acid, such as the sulphuric, is present to dissolve the oxide so formed.

For instance, if we place in a flask containing zinc and sulphuric acid, a soluble chromate, or chromic acid, a solution of the protoxide in sulphuric acid results.

This fact may be turned to account in analysing the ores of chrome; the indications are susceptible of great accuracy, and much dexterity of manipulation is not required for the performance of the assay. The following is the mode of procedure:—

A given weight of the ore is to be well pulverised, and strongly ignited in an iron crucible, with more than sufficient nitrate of potassa or soda (I give preference to the latter), to effect the oxidation of the oxide of chrome, and yield base for the chromic acid to combine with. The ignition may be continued for an hour; a strong red or white heat being employed. The best criterion of the completion of the operation is the cessation of the appearance of boiling which the mass exhibits. At this period a small quantity of fine iron filings may be thrown in and raked about, in order to decompose any remaining nitrate.

The resulting chromate is then to be washed away from the iron and other matters, and the solution, when clear, decanted into another vessel, some dilute sulphuric acid added, and the solution evaporated until it acquires a convenient bulk. The solution is to be placed in a flask with a given weight of zinc. The apparatus employed by Mr. Lewis Thompson, and sketched in the October number of this journal, may be advantageously used, with the addition of a long tube with a funnel-end passing through the same cork as the tube to convey the gas into the funnel, which funnel should be made to touch the bottom of the flask. Dilute sulphuric acid is then to be poured through the funnel into the flask, and when the zinc is entirely dissolved, we learn the quantity of chromic acid, and by the difference between the amount of hydrogen obtained, and that which it would have yielded, had not the chromic acid been present, *i. e.*, the amount of hydrogen required to reduce the chromic acid to the state of protoxide. These particulars will soon suggest themselves to the analyst.

If, instead of placing the chromic acid in the vessel containing sulphuric acid and zinc, the current of hydrogen be transmitted through the solution contained in another vessel, no decomposition ensues.

The remarkable and peculiar properties possessed by hydrogen at the moment of its liberation, have frequently been observed by chemists; but I am not aware that the cause of the effects noticed has ever been made the subject of a searching investigation; that it is worth one all will agree; it might throw some light on the state of hydrogen, and probably other gaseous matters, when in combination.

May not hydrogen at the moment of its liberation be in a *liquid state?* and would not this account for much that has hitherto been unexplained? This is merely a crude idea; but it seems not improbable, inasmuch as it doubtless exists in that state in water, in the same manner as carbonic acid does in the solid form in the carbonate of lime.

EXPERIMENTS INTENDED TO ESTABLISH THE DIFFERENCE BETWEEN FLUOBORIC ACID AND HYDROFLUOBORIC ACID.*

BY J. BERZELIUS.

Fluoboric acid was discovered in the year 1810, by Thénard and Gay-Lussac, and described in their *Recherches Physico-Chimiques*, t. ii., p. 38. They obtained it by causing water to absorb as much fluoboric gas as was requisite for saturation, this gas being likewise a discovery of theirs. Prepared in this way, it presented a thick, dense liquid, giving out fumes, and from which a certain quantity of fluoboric gas might still be expelled by boiling; but the latter operation being performed, the acid no longer fumed, and distilled without alteration, its boiling point being high. It therefore resembles sulphuric acid; like this acid it blackens various organic substances. Gay-Lussac and Thénard state that it forms with bases peculiar salts, but they only tried to produce the ammoniacal salts, on subliming which, boracic acid being left behind, they succeeded in demonstrating this acid to be composed of boracic acid and hydrofluoric acid, considered then, according to the views of the day, as oxygenated acids.

From the experiments on various fluoboric combinations which I communicated to the Royal Academy in 1824, it results that the fluoboric gas, when absorbed by water, without having been brought to a higher point of saturation, deposits boracic acid, partly under the form of a powder, and partly—by refrigerating the liquid which became hot by absorption of the gas—under that of crystals. Since the chemical notions of the nature of salts have been established, we think we have reason to believe that the fluoboric gas consists of a combination of fluorine and boron, containing no oxygen, and which, like other similar combinations, must be decomposed by water in such a way that the oxygen (of the water) combines with its radical, and the hydrogen with the halogen. This fact therefore did not happen unexpectedly; and showing that in that manner boracic acid and fluoboric acid were formed, it indicated at the same time the hitherto unknown proportion in which boron and fluorine were combined. But it happened in contradiction to what generally occurs, that in this way the water did not decompose the whole of the fluoboride, but only ¼ part of it, and that, after the removal of the boracic acid the remainder was an acid liquid, which, saturated with bases, formed peculiar salts free from oxygen, which I called fluoboric salts, composed of one atom of fluoride and one atom of fluoboride, and of which I described those which are formed by the more common and more active salt bases. (K. V. Acad. Handl, 1823, p. 68.) In the hydrofluoboric acid which I examined, one-fourth part of the boron of the fluoboride was exchanged for hydrogen, but in the fluoboric acid of Thénard and Gay-Lussac the fluoboron is apparently not decomposed, but combined with the water without boracic acid having been separated. Hence naturally follow the questions—What is this acid? and how do its salts formed with bases act comparatively with the fluoboric salts? Before I answer these questions, I

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[*] From the *Kongl. Vet. Acad. Handl.*, 1842, and *Annalen der Chemie und Pharmacie*, Band XLVI., Heft. I. R.

intend to make some remarks on the degree of certainty which attaches to our knowledge of the composition of fluoborures. We know the difficulties which we had to overcome in ascertaining the atomic weight of the boron as regards the quantity of oxygen contained in the boracic acid as well as the number of atoms of oxygen of which it consists. From the experiments made thereon, we concluded that it was composed of one atom of boron and three atoms of oxygen.

According to what is known, there is good reason to believe that the gases of all elements contain in a certain volume the same number of simple atoms. Their specific heat is also in accordance with that, which is equally alike, and the exceptions which occur, for instance, with the gases of sulphur and phosphorus, rest evidently on allotropic causes. For in all known combinations of the gases of sulphur and phosphorus which we can weigh, the specific gravity is fully in conformity with this assertion, if we only take into consideration the ratio of condensation which usually takes place with analogous combinations, and the trifling aberrations which the atmospheric pressure causes by acting on more coercible gases, and which, in our case, may be entirely neglected.

Hence it follows, that the normal sp. gr. of each element in the form of a gas will be in direct ratio to its atomic weight, or as the sp. gr. of hydrogen is to its atomic weight. It is then possible to calculate the sp. gr. of an element which it presents, under a temperature which transforms it to the gaseous state, even if it be not in our power then to weigh it effectually; and the atomic weight once well established, we may better rely on the result than on the attempt to weigh it, even if it were practicable.

Boron is of the number of bodies which cannot be obtained in the form of gas; its sp. gr. under that form must then be made out by calculation. Its atomic weight is 489·153 (oxygen being =100), and its sp. gr. is, according to Baron Wrede =1·1052. Hence the following simple equation.—100 : 1·1052=489·153 : 1·50435, which is the sp. gr. of the boron in the gaseous form, and in a similar way we find that the sp. gr. of fluoric gas will be =1·2928. The boracic acid is composed of one atom boron and three atoms oxygen, and if the fluoboride be decomposed by water, it forms nothing more nor less than fluoboric acid and hydrofluoric acid; therefore the fluoboride must be composed of one atom boron, and six atoms, or three equivalents of fluorine. Dumas weighed the fluoboric gas, and found its sp. gr. to be =2·3124. In the form of gas it must be composed of—

1 vol. boracic gas	=1·50435
6 ,, fluoric gas	=7·75680
in the whole	=9·26115

If these seven volumes, at the moment of combination, were to be condensed from seven to four vols., the usual ratio of condensation, if a greater number of simple volumes entered into one gas, the sp. gr. of the fluoboric gas would then be $\frac{9{\cdot}26115}{4}=2{\cdot}3153$, and it consists of one volume boron, and three volumes fluorine, which correspond to six volumes of the simple fluoric gas.

If we make a corresponding calculation with regard to chloroboric gas, of which the sp. gr. of one constituent could be controlled by directly weighing it, we arrive at an equally satisfactory result. Dumas determined the sp. gr. of the chloroboric gas by weighing it directly, and found it to be=4·03532,

1 vol. boracic gas	= 1·50435
6 ,, chloric gas	=14·64204
	16·14639

condensed from seven to four vol. we obtain $\frac{16{\cdot}14639}{4}=4{\cdot}03659$.

It results, from the accordance of the two, that the atomic weight of boron, as it is found, must be pretty near to the real one.[*]

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[*] It deserves to be noticed, that if we subject to the same calculation the gaseous combination of silicon with fluorine and chlorine, we likewise obtain concordant results. Dumas weighed them both, and found fluosilicon 3·600, and chlorosilicon 5·939.

1 vol. silicon gas =	3·0649
6 vol. fluorine gas =	7·7568
	10·8217

1 vol. silicon gas =	3·0649
6 vol. chlorine gas =	14·6420
	17·7069

But here it appears that the seven volumes did not condense to four, but to three, for $\frac{10{\cdot}8217}{3}=3{\cdot}6072$ and $\frac{17{\cdot}7069}{3}=5{\cdot}9023$

The volume of the halogens was here condensed to half, and the volume of the silicon disappeared. This difference between the two is not done away with by calculating other relative atomic proportions in the combinations of one of them, or both, with oxygen or halogens.

From the above it follows with certainty that fluoboron is composed of one atom of boron and three double atoms, or equivalents of fluorine = BFl^6, and that in consequence thereof, scientifically, it ought to be termed *superfluoride of boron (borsuperfluorid)*. If dissolved in water and saturated, the superfluoride of boron deposits no boracic acid, or if that is deposited in the beginning, it will be redissolved in such a way that the concentrated liquid will contain no free boracic acid: then this liquid ought to be either a solution of unaltered superfluoride of boron, or a combination of hydrofluoric acid, with boracic acid. If it is simply a solution of superfluoride of boron, it ought to be decomposed by bases. If it is a chemical combination of hydrofluoric acid with boracic acid combined with water—that is to say, a hydrated double acid, it ought to enter into combinations with bases in a similar way to what it does with water—viz., it ought to yield double salts, in which one atom of a borate is combined with three atoms of fluoride of the bases, for each atom of boracic acid contained in the salt, and it must be possible to produce them in the direct way by bringing together a borate and a fluoride.

Therefore I dissolved together 1 atomic weight of NaO, BO^3 and 3 atomic weights of fluornatrium in boiling water, and similarly 1 atomic weight $NaO, {}^2Bo^3$ (borax) and 6 atomic weights fluornatrium. The salts were newly calcined previous to being weighed. The solutions evaporating by a gentle heat, were left to crystallise; they formed regular crystals all of the same kind to the last drop, without one of the salts having separately crystallised. Both the double salts are transparent, and unchanged, if exposed to the air, but they lose their water of crystallisation and become white, without deliquescing, if they are kept in a place at + 40° (probably Reaum = 122° F.) The form of the crystals is according to Wallmark's examination alike in both, viz. tetraedric prisms, apparently rectangular, which are obliquely obtuse at the ends, and with two obtuse margins. They seem to belong to the triclinometric or tetraprismatic system. They are of an alkaline reaction and augment in volume before they fuse, but considerably less than the simple borates. The salt fused before the blowpipe is transparent like glass, when solid. The salt, composed of $NaO, BO^3 + 3NaF^2$, heated in a platinum crucible, lost 27 per cent. of its weight, corresponding to the formula $3NaF^2 + NaO, BO^3 + 8H^2O$, which calculation proves to be 27·26 per cent. water. The fused mass on being slowly cooled became filled with little milky grains, so that it retained its transparency only at its thin edges which solidified first. Dissolved in cold water, it left a transparent undissolved granular saline mass, which externally resembled the borofluornatrium, but it manifested its nature by depositing little crystals of fluornatrium, which being boiled with the liquid after having been diluted with a sufficient quantity of water were redissolved. On evaporating, it reproduced the double salt in clear crystals, endowed with a great many surfaces.

The salt $= 6NaF^2 + NaO, {}^2BO^3$ on being calcined lost 35·8 per cent., corresponding to 22 atoms of water, which, according to calculation, amount to 35·94 per cent.* corresponding to the formulæ:—

$$3NaF^2 + NaO, BO^3 + 8H^2O$$
$$3NaF^2 + BO^3, {}^2H^2O + 12H^2O$$

The proportion of water allowed to each of the combinations is arbitrary, indeed, and may be 10 atoms in each, if it is not proved that the amount of the water of crystallisation in this combination is the same as when the salt crystallized by itself. The fused mass of this salt contained likewise some white milky crystals of fluornatrium, between which the remainder of the substance was transparent. After having been redissolved in boiling water, on being evaporated, it crystallised to the last drop, without depositing borofluornatrium, and without giving rise to the suggestion that on calcining the salt it formed fluoboron and seceded from it.

The last link of the just mentioned salt contains a combination of fluornatrium with boracic water, in the same relative ratio, as between the boracic water and hydrofluoboric acid in the above mentioned fluoboric acid. Here the question arises: Can this combination exist alone? To decide this, I dissolved one atom of crystallized boracic acid dried in the air, $3H^2O, BO^3$, and three atoms of calcined fluornatrium in boiling water, and evaporated the solution by a gentle heat, which on being cooled, and afterwards under continued spontaneous evaporation, the combination formed crystals exactly like those of the foregoing salts, without fluornatrium or boracic acid having crystallised separately. But the amount of water in the combination could not, unfortunately, be precisely ascertained, because, when the salt was fused it evolved superfluoride of boron. The salt did not possess the property of efflorescing in warm air. The crystals belonged to the rhomboedral system.

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* That in these experiments the amount of water was found somewhat less, must be ascribed to the property of those salts of losing on their surface a small portion of water of crystallization if exposed to dry air, and of becoming opaque.

Moreover it is remarkable that borate and fluoride seem to require the presence of water in order to be maintained in combination, and that in the fused state they are separated on cooling by the influence of crystallization. Dissolved in water, they precipitate with salts, earths, and metals, which in most cases are redissolved, till a certain quantity of the precipitating medium is added. If, then, a larger quantity be added, the precipitate is redissolved, but generally leaving a small portion of fluoride separated.

The solution of $Na\,O, 2\,B\,O^3 + 6\,Na\,F^2$ precipitates with chloride of calcium only fluoride of calcium, recognisable by its gelatinous state as well as by its property of evolving hydrofluoric acid if treated with sulphuric acid, after having been washed and dried again.

I fused borax and fluoride of calcium in the proportion requisite for forming a double salt, adding a small excess of borax; pulverised the glass, and distilled it in a glass retort with a sufficient quantity of concentrated sulphuric acid; the acid distilled over in conjunction with free boracic acid.

The glass vessel was not attacked. The distilled acid was then mixed in a platinum crucible with dilute and pure hydrofluoric acid, with the view of securing the boracic acid, and afterwards evaporated in a water-bath until the hydrofluoric acid was expelled; then it was boiled over a spirit lamp during half an hour in the crucible, its cover being inverted, whereon a great part of the acids escaped under the form of thick fumes. The acid was then committed to cooling under a bell-glass and over concentrated sulphuric acid. At + 18° R. (75° F.), its sp. gr. was 1·5842. Of that acid 10·511 grammes were weighed, diluted with water, and placed in a platinum crucible, which was likewise weighed, poured on 75·175 grammes of recently calcined and pulverised oxide of lead. The mixture was then evaporated at a gentle heat to dryness, agitating from time to time, and then the mass was fused in the crucible. It now weighed 81·54 grammes, and had, therefore, lost 4·176 gr. of water. One hundred parts were, consequently, composed of

Superfluoride of boron	60·27
Water	39·73

But of that water, part was oxygen in the boracic acid, and hydrogen in hydrofluoric acid. One atom superfluoride of boron weighs 837·606, which, according to the just-stated relative proportion was combined with 544·41 parts of water, that, with a difference of — 18·0 corresponds to five atoms of water, which weigh 562·4. This slight deviation, easily attributable to some error in the experiment, was found on examination to originate in a very trifling portion of sulphuric acid contained in the fluoboric acid, but so inconsiderable in quantity, that I thought it unnecessary to repeat the experiment. Hence it follows that fluoboric acid of 1·5842 sp. gr. is composed of one atom boracic acid, three double atoms of hydrofluoric acid, to which are added three atoms of water and two atoms of water $= BO^3 + 3H^2F^2 + 2H^2O$. It is probable that if the concentrated acid were prepared in the inverted order, so that it be supersaturated with superfluoride of boron, and if the excess were expelled by boiling, it would possess a higher sp. gr., and would contain only one atom of water.

It results, then, from that investigation, that the fluoboric acid of Thénard and Gay-Lussac is a hydrated double acid, composed of three equiv. of hydrofluoric acid and of one equiv. boracic acid, and that its salts are composed of a combination of an oxygenated salt and of a haloïd salt; whereas the hydrofluoboric acid which I described, and which takes rise when the concentrated hydrofluoric acid absorbs the gaseous superfluoride of boron, a geminal hydrofluoric acid, whose fluorine being superfluoride of boron is composed of one atom each, and whose salts contain no oxygen, but consist of one atom fluorid combined with one atom superfluoride of boron. The hydrosilicofluoric acid is composed of three atoms hydrofluoric acid and two atoms of siliconosuperfluoride.

AN EFFORT TO REFUTE THE ARGUMENTS ADVANCED IN FAVOR OF THE EXISTENCE, IN THE AMPHIDE SALTS, OF RADICALS CONSISTING, LIKE CYANOGEN, OF MORE THAN ONE ELEMENT.*

(*Continued from page* 441.)

BY ROBERT HARE, M.D., PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF PENNSYLVANIA.

XVII. Let us, in the next place, consider the argument in favor of the existence of such radicals, founded on the similitude of the haloid and amphide salts, which is stated by Dr. Kane in the following words:—

"It had long been remarked as curious, that bodies so different in composition as the compound of chlorine with a metal on one hand, and of an oxygen acid with the oxide of the metal on the other, should be so similar in properties that both must be classed as salts, and should give rise to a series of basic and acid compounds for the most part completely parallel."—*Elements, p.* 681.

XVIII. Upon the *similitude* and *complete paralellism* of the amphide and haloid salts, thus erroneously alleged, the author proceeds to argue in favor of the existence in the former of compound halogen bodies, analogous in their mode of combination to chlorine or iodine.

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* Communicated by the Author.

XIX. I presume it will be granted, that if similitude in properties be a sufficient ground for inferring an analogy in composition, dissimilitude ought to justify an opposite inference. And that if, as the author alleges, certain bodies have been classed as salts, on account of their similarity in this respect, when dissimilar they ought not to be so classed. Under this view of the question, I propose to examine how far any similitude in properties exists between the bodies designated as salts by the author or any other chemist.

XX. The salts hitherto considered as compounds of acids and bases, are by Berzelius called amphide salts, being produced severally by the union with one or other of his amphigen class, comprising oxygen, sulphur, selenium, and tellurium, with two radicals, with one of which an acid is formed, with the other a base. The binary compounds of his halogen class, comprising chlorine, bromine, iodine, fluorine, and cyanogen, are called by him haloid salts. I shall use the names thus suggested.

XXI. Among the haloid salts, we have common salt and Derbyshire spar; the gaseous fluorides and chlorides of hydrogen, silicon or boron; the fuming liquor of Libavius; the acrid butyraceous chlorides of zinc, bismuth and antimony; the volatile chlorides of magnesium, iron, chromium, and mercury, and the fixed chlorides of calcium, barium, strontium, silver, and lead; the volatile poison prussic acid, and solid poisonous bicyanide of mercury, with various inert cyanides like those of Prussian blue: likewise a great number of etherial compounds.

XXII. Among the amphide salts are the very soluble sulphates of zinc, iron, copper, soda, magnesia, &c., and the insoluble stony sulphates of baryta and strontia; also ceruse and sugar of lead; alabaster, marble, soaps, ethers, and innumerable stony silicates, and aluminates. Last, but not among the least discordant, are the hydrated acids, and alkaline and earthy hydrates.

XXIII. When the various sets of bodies, above enumerated, as comprised in the two classes under consideration, are contemplated, is it not evident, that, not only between several sets of haloid and amphide salts, but also between several sets in either class, there is an extreme discordancy in properties? so that making properties the test would involve not only that various sets in one class could not be coupled with certain sets in the other, but, also, that in neither class could any one set be selected as exemplifying the characteristics of a salt, without depriving a majority of those similarly constituted, of all pretensions to the saline character?

XXIV. Now, if among the bodies above enumerated, some pairs of amphide and haloid salts can be selected, which make a tolerable match with respect to their properties, as in the case of sulphate of soda, and chloride of sodium, while in other cases there is the greatest discordancy (as in the stony silicate felspar, and the gaseous fluoride fluosilicic acid gas; as in soap and Derbyshire spar; as in marble and the fuming liquor of Libavius, the sour protochloride of tin, and sweet acetate of lead), is it reasonable to found an argument in favour of a hypothetical similitude in comparison, on the *resemblance* of the two classes in properties? Does not the *extreme* dissimilitude in some cases, more than countervail the limited resemblance in others? And when the great variety of properties displayed both by the amphide and haloid salts is considered, is it a cause for wonder or perplexity, that in some instances, amphide salts should be found to resemble those of the other kind?

XXV. Again, admitting that there was any cause for perplexity agreeably to the old doctrine, is there less, agreeably to that which is now recommended? Is there no ground for wonder that oxygen or sulphur cannot act as simple halogen bodies? By what rule are their binary compounds to be excluded from the class of haloid salts? Wherefore should chlorides, bromides, iodides, and fluorides, however antisaline in their properties, be considered as salts, while in no case is an oxide, a sulphide, selenide or telluride to be deemed worthy of that name?

XVI. I challenge any chemist to assign any good reason wherefore the red iodide of mercury is any more a salt than the red oxide, or the protochloride is more saline than the sulphide: or why the volatile oxides of osmium or of arsenic are less saline than horn silver or horn lead; or the volatile chloride of arsenic, than the comparatively fixed sulphides of the same metal: why gaseous chlorohydric acid is more saline than steam or gaseous oxhydric acid.

XXVII. It much surprises me, that when so much stress is laid upon the idea of a salt, the impossiblity of defining the meaning of the word escapes attention. How is a salt to be distinguished from any other binary compound? When the discordant group of substances which have been enumerated under this name is contemplated, is it not evident that no definition of them can be founded on community of properties; and, by the advocates of the new doctrine, composition has been made the object of definition, instead of being the basis; thus, agreeably to them, a compound is not a salt, because it is made of certain elements; but, on the contrary, an element, whether simple or compound, belongs to the class of salt radicals, because it produces a salt. Since sulphur, with four atoms of oxygen, SO^4, produces a salt with a metal, it must be deemed a salt radical.

XXVIII. In proof that the double chlorides are not united in a way to justify the opinion adopted by Bonsdorff, Thomson, myself, and others, it is alleged by Graham, "*that in such compounds the characters of the constituent salts are very little affected by their state of union.*"

XXIX. This allegation being, in the next page, admitted to be inapplicable in the case of the double cyanides, an effort is made to get over this obstacle by suggesting the existence of another compound radical. But the allegation of the author is erroneous as respects various double haloid salts, especially the fluosilicates, the fluoborates, fluozirconiates, the chloroplatinates, chloroiridiates, chloroosmiates, chloropalladiates, &c., all of them compounds in which the constituent fluorides and chlorides exist in a state of energetic combination by which they are materially altered as to their state of existence.

XXX. Evidently the word salt has been so used, or rather so abused, that it is impossible to define it, either by a resort to properties or composition; and I conceive, therefore, that to make it a ground of abandoning terms which are susceptible of definition, and which have long been tacitly used by chemists in general, in obedience to such definition, would be "*a retrograde movement in the science.*" I hope Dr. Kane will pardon me for employing the language to which has resorted, in speaking of the opinions of Bonsdorff.

XXXI. If this doctrine, as it has been stated, is to prevail, I do not perceive how it is to be prevented from claiming an inconvenient extension. The hydrates, as well as the sulphates, must have pretensions to contain salt radicals. Hence in the hydrated alkalis and alkaline earths, there would be a compound radical, consisting of hydrogen, with two atoms of oxygen, hydroxion, and these compounds would be hydroxianides; nor can I conceive that the haloid compounds, erroneously called double salts, but more correctly considered as single salts, can be exempted.

XXXII. Between the reaction of fluoboric acid with fluobases, and sulphuric acid with oxybases, is there not a great resemblance?

XXXIII. I am unable to understand how, if the existence of salt radicals in oxysalts is inferred, the other salts of the amphigen class can be exempted from a corresponding inference. But if the existence of salt radicals in the double sulphides be admitted, can it be consistently denied that they exist also in double chlorides, iodides, &c.? Is there not the greatest analogy between the habitudes of sulphur, selenium, and tellurium, with metals, and those of the halogen bodies?

XXXIV. Would not the modification of the etherial oxysalts, to comport with the new hypothesis, be disadvantageous, both as respects our mental conception of those compounds, and the names which would be rendered appropriate? Would not the transfer of the oxygen from the etherial oxide to the acid, and the creation, thus, of new salt radicals for the organic acid salts, be objectionable; such as oxyoxalion for oxalates, oxytartarion for tartrates, oxyacetion for oxyacetates; while, for their compounds, we should have oxyoxalionides, oxytartarionides, oxyacetionides, &c.?

XXXV. If sulphates are to be considered as oxysulphionides by what names are we to designate the sulphites, hyposulphites, and hyposulphates, SO^2, $S^2\ O^3$, $S^2\ O^5$? SO^3 may, perhaps, with more propriety, be considered as consisting of a compound radical, SO^2, and oxygen, forming an oxide of sulphurous acid; but in a sulphite, anhydrous sulphuric acid, SO^3 becomes a species of oxysulphion itself, being as much the oxysulphion of the sulphites, as SO^4 is of the sulphates. Of course SO^3 should have a direct affinity for radicals, contrary to fact. I presume that sulphites would have to be trioxysulphionides; hyposulphites, sesquioxysulphionides; sulphates, quadroxysulphionides; while the hyposulphates would, I suppose, be demi-quintoxysulphionides!!!

XXXVI. Analogous complication in nomenclature would arise in respect to the nitrites and nitrates, phosphites and phosphates, arsenites and arseniates; also as respects the carbonic and oxalic acids.

XXXVII. It is true that nature has not so made her bodies as that they can be separated into classes between which any distinct line can be drawn, still it has been found advantages to classify them to the best of our power. Accordingly it appears to me expedient, in the first place, to distinguish elements (or those compounds which act like them) according to their electro-chemical relations to each other, or their habitudes with the voltaic electrodes. Consistently, chemists have tacitly adopted the plan of treating the compounds formed by electro-negative elements with anions, as acids; those formed with cathions, as bases; while the combinations formed by the union of such acids and bases have been considered as simple salts. Thus four classes are constituted, consisting of electro-negative elements, of acids, bases, and single salts, while, by the union of the latter, a fifth class of double salts is formed. Whether the words acid base, and salt be adhered to, objectionable as they are in some respects, and especially the latter, or some others be contrived, it would seem to me disadvantageous to merge them in one name, pursuant to the views of the advocates of salt radicals, as stated by Gregory in his edition of "Turner's Chemistry," 572.

XXXVIII. The objection that not being electrolytes the relation of acids and bases to the voltaic electrodes cannot be discovered, is easily remedied; since, on the union of a common ingredient with an anion and a cathion, there cannot be any doubt that the resulting compounds will have the same electro-chemical relation as their respective heterogeneous ingredients; so that, with the anion, an acid or electro-negative body will be formed; with the cathion, a base or electro-positive body. Moreover, as respects organic compounds which cannot be subjected to the electrolytic test, whatever saturates an inorganic acid must be a base, and whatever saturates an inorganic base must be an acid.

XXXIX. The word salt, I have shown, is almost destitute of utility, from the impossibility of defining it, and the amplitude of its meaning. A word that means everything is nearly as useless as that which means nothing.

XL. As respects the three phosphates of water, PO^5+HO, PO^5+2HO, PO^5+3HO, the argument used by Dr. Kane cuts both ways; although, by its employer, only that edge is noticed which suits his own purpose. It is alleged that the difference of properties, in these phosphates, is totally inexplicable upon the idea of three degrees of "hydration;" but that all difficulty vanishes, when they are considered three different compound salt radicals, oxyphosphionides of hydrogen, PO^6+H, PO^7+2H, PO^8+3H.

XLI. To me the formation of three compound elements, by the reiterated addition of an atom, of which five of the same kind were previously in the mass to which the addition is made, seems more anomalous, mysterious and improbable, than the existence of three compounds of phosphoric acid with water, in which the presence of the different proportions of water is the consequence of some change in the constitution of the elements which is referred to isomerism.

XLII. No reason can be given why the addition of *one*, *two*, and *three atoms* of *oxygen*, to the "radical," should convey a power to hold a proportional number of atoms of hydrogen. Such an acquisition of power is an anomaly.

XLIII. In the case of radicals formed with hydrogen in different proportions, as in acetyl, and ethyl, formyl and methyl, the the number of atoms of oxygen in the peroxides, is the inverse of the hydrogen in the radical.

XLIV. Ethyl, C^4, H^5, unites, at most, with one atom of oxygen, while acetyle, C^4, H^3, takes three atoms to form acetic acid, C^4, H^3, O^3. Methyl, C^2, H^3, forms, in like manner, only a protoxide, while formyl, C^2, H, takes three atoms to constitute formic acid.

XLV. Besides the three oxyphosphions, of which the formulas are above stated, there would have to be another in the phosphites; so that instead of the hydrated acid, or phosphite of water, being PO^3+HO, it would have to be PO^4+H, a fourth oxyphosphionide of hydrogen.

XLVI. Respecting the new principles which I have been contesting, Dr. Kane alleges "that the elegance and simplicity with which the laws of saline combination may be traced from them is remarkable," because he conceives, that without an appeal to those principles, the fact that the number of equivalents of acid in a salt are proportionable to the number of equivalents of oxygen in the base, would be inexplicable.

XLVII. Thus, when the base is a protoxide, we have one atom of the protoxide of hydrogen to take its place; when the base is a sesquioxide (two of radical and three of oxygen), three atoms of the protoxide of hydrogen take its place: if the base be a bioxide, two atoms of the protoxide of hydrogen take its place.

XLVIII. I have already adverted to the existence of certain chemical laws, inexplicable in the present state of human knowledge. Among these is that of the necessity of oxidation to enable metallic radicals to combine with acids. But as a similar mystery exists as respects the adventitious property of combining with radicals, which results from the acquisition of an additional atom of oxygen by any of the compounds hitherto considered as anhydrous acids, the new doctrine has in that respect no pre-eminent claim to credence.

XLIX. But if, without impairing the comparative pretentions of the prevailing doctrine, we may appeal to the fact that the acquisition of an atom of oxygen confers upon a radical the basic power to hold one atom of acid, is it not consistent that the acquisition of two atoms of oxygen should confer the power to hold two atoms of acid, and that with each further acquisition of oxygen a further power to hold acids should be conferred?

L. So far then there is in the old doctrine no more inscrutability than in that which has been proposed as its successor. Since if on the one hand it be requisite that for each atom of oxygen in the base there shall be an atom of acid in any salt which it may form, on the other, in the case of the three oxyphosphions, for each additional atom of hydrogen extraneous to the salt radical there must be an atom of oxygen superadded to this radical.

LI. It being then admitted that, numerically, the atoms of acid in any oxysalt will be as the atoms of oxygen in the base, it must be evident that whenever an oxysalt of a protoxide is decomposed by a bioxide, there will have to be two atoms of the former for one of the latter. For the bioxide has two atoms of oxygen, and requires by the premises two atoms of acid, while the salt of the protoxide, having but one atom of oxygen, can hold, and yield, only one atom of acid. Two atoms of this salt, therefore, whether its base be water, or any other protoxide, will be decomposed by one atom of bioxide; provided the affinity of the acid for the bioxide predominate over that entertained for the protoxide, as when water is the base.

LII. It follows that the displacement of water from its sulphate, adduced by Kane, does not favour the idea that hydrous sulphuric acid is an oxysulphionide of hydrogen, more than the impression that it is a sulphate of water.

LIII. Of course, in the case of presenting either a sesquioxide, or a trioxide, to the last mentioned sulphate, in other words, hydrous sulphuric acid, the same rationale will be applicable.

LIV. The next argument advanced by Dr. Kane is, that *some* of the acids of which the existence is assumed upon the old doctrine, are hypothetical, as they have never been isolated. This mode of reasoning may be made to react against the new doctrine with pre-eminent force, since *all* of the compound radicals imagined by it are *hypothetical*—*none* of them having been isolated.

LV. The third argument of the respectable author above named is, that acids display their acid character in a high degree only when in the combination with water.

LVI. This argument should be considered in reference to two different cases, in one of which all the water held by the acid is in the state of a base, while in the other an additional quantity is present, acting as a solvent. So far as water, *acting as a solvent*, facilitates the reaction between acids and bases, it performs a part in common with alcohol, ether, volatile oils, resins, vitrifiable fluxes, and caloric. Its efficacy must be referred to the general law, that fluidity is necessary to chemical reaction. "Corpora non agunt nisi soluta."

LVII. In a majority of cases, basic water, unaided by an additional portion acting as a solvent, is quite incompetent to produce reaction between acids and other bodies. Neither between sulphuric acid and zinc, between nitric acid and silver, nor between glacial or crystallized acids and metallic oxides, does any reaction take place without the aid of water acting as a solvent, and performing a part analogous to that which heat performs in promoting the union of those oxybases with boric, or silicic acid.

LVIII. It is only with *soluble* acids that water has any efficacy. The difference between the energy of sulphuric and silicic acid, under the different circumstances in which they can reciprocally displace each other, is founded on the nature of the solvents which they require, the one being only capable of liquefaction by water, the other by caloric.

LIX. In support of his opinions the author adverts to the fact, that with hydrated sulphuric acid, baryta will combine energetically *in the cold*, while a similar union between the anhydrous vapour and the same base cannot be accomplished *without heat*. But it ought to be recollected that to make this argument good, it should be shown wherefore heat causes the baryta, a perfectly fixed body, to unite more readily with an aëriform substance in which increase of temperature must, by rarefaction, diminish the number of its particles in contact with the solid. If the only answer be that heat effects some mysterious changes in affinity (or, as I would say, in the electrical state of the particles), it should be shown that the presence of water or any other base has not been productive of a similar change, before another explanation is held to be necessary. But I would also call to mind that the hydrated acid is presented in the liquid state; and if it be asked why water, having less affinity than baryta, can better cause the condensation of the acid, I reply, that it is brought into contact with the acid both as a liquid and a vapour, of neither of which forms is the earthy base susceptible. But if all that is necessary to convert anhydrous sulphuric acid into an oxysulphionide be an atom of oxygen and an atom of metal, what is to prevent baryta and anhydrous sulphuric acid from forming an oxysulphionide of barium? All the elements are present which are necessary to form either a sulphate or oxysulphionide; and I am unable to conceive wherefore the inability to combine does not operate as much against the existence of radicals as of bases.

LX. I would be glad to learn why, agreeably to the salt radical theory, anhydrous sulphuric acid unites with water more greedily than with baryta, and yet abandons the water promptly on being presented to this base. Why should it form an oxysulphionide with hydrogen more readily than with barium, and yet display, subsequently, a vastly superior affinity for barium?

LXI. It seems to be overlooked that anhydrous sulphuric acid, being the oxysulphion of the sulphites, ought to form *sulphites* on contact with metals.

LXII. But if the sulphate of water owe its energy to that portion of this liquid, which, by its decomposition gives rise to the compound radical oxysulphion, and not to the portion which operates as a solvent. wherefore in the concentrated state, will it not react with iron and zinc, without additional water, when, with dilution, it reacts most powerfully with those metals?

LXIII. Some stress has been laid upon the fact that sourness is not perceived, excepting with the aid of water, as if to derive force for the new doctrine from that old and popular, though now abandoned, test of acidity; but it should be recollected that it is not the water which goes to form the compound element in the "*hydracids*," erroneously so called, which confers sourness. Will any one pretend that either sulphuric or nitric acid, when concentrated, is sour? Are they not caustic? Can any of the crystallized organic acids be said to have a sour taste, independently of the moisture of the tongue? The hydrated oily acids being incapable of uniting with water as a solvent, have none of these vulgar attributes of acidity. The absence of these attributes in prussic acid would alone be sufficient to render it inconsistent to consider them as having any connexion with the presence of hydrogen.

LXIV. It has been remarked that liquid carbonic acid does not combine with oxides on contact. To this I would add, that it does not combine with water under those circumstances, but, on the contrary, separates from it like oil, after mechanical mixture; nor does it, under any circumstances, unite with an equivalent proportion of water to form a hydrate. Of course, as it is not to basic water that it is indebted for its ability to become an ingredient in salts, it cannot be held that this faculty is the result of its previous conversion into an *oxycarbionide of hydrogen*.

LXV. Chromic acid is admitted not to require water for isolation, and cannot, therefore, be considered as oxychromionide of hydrogen. Yet the oil of bitter almonds, which consists of a *compound radical*, benzule, and an atom of hydrogen, and which is therefore constituted precisely as the salt radical doctrine requires for endowment with the attributes of an "hydracid," is utterly destitute of that acid reaction which hydrogen is represented as peculiarly competent to impart. It follows that we have, on the one hand, in chromic acid, a compound endowed with the attributes of acidity, without being a hydruret of any compound radical; and, on the other, in oil of bitter almonds, a hydruret of a compound radical, without any of the attributes of acidity.

LXVI. The last argument in favour of the existence of salt radicals which I have to answer is that founded on certain results of the electrolysis of saline solutions.*

(To be concluded in our next.)

ON THE TRUE CONSTITUTION OF NITROGEN†.

BY REUBEN PHILLIPS.

Scarcely had Davy discovered the compound nature of alkalis and earths, when the compound nature of nitrogen began to be a subject of discussion among chemists. The following experiments, if free from error, will, in a great measure, clear up the subject.

FIRST EXPERIMENT.

Having occasion to heat, nearly to whiteness, out of contact of the air, a mixture of common salt, iron, charcoal and lime, the contents of the crucible on being mixed with water, and the clear solution decanted, and then blowing some air from the lungs through a portion of it, I exhaled a strong smell of prussic acid. Wishing to obtain better evidence of the presence of the hydrocyanic acid, the solution was treated with a solution of potassa, and then with a solution of the protosulphate of iron, allowing an excess of potassa; the solution was then maintained at the boiling point for a few minutes, and the solid matter allowed to fall, the clear fluid was decanted, and tested for the ferrocyanide, by saturation with sulphuric acid, diluted with about two or three times its bulk of water, in which acid some persulphate of iron was dissolved—(in narrating future experiments in this paper, in which it was necessary to test for a cyanide, let it be understood that the preceding was the method uniformly employed)—the fluid instantly became of a celestial blue.

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* It is well known that Faraday employed a very simple instrument to ascertain the quantity of the gaseous elements of water yielded in a given time, by a liquid subjected to the voltaïc current. It consisted of a graduated tube, through the cavity of which the current was conveyed by wires, so terminating within it, as to have an interval between them through which the current, being conveyed by the electrolytic process, effected the decomposition of the intervening liquid, the resulting gas being caught and measured by the tube. This instrument has been called a volta electrometer, or voltameter.

Faraday found that when various substances were electrolysed, a voltameter being at the same time in the circuit, that for every equivalent of water decomposed within the tube, neither more nor less than an equivalent of the other body could be decomposed.

† Communicated to The Chemist by the Author.

SECOND EXPERIMENT.

Carbon and lime, brought to nearly a white heat, and afterwards tested for Prussian blue; it gave none.

THIRD EXPERIMENT.

Iron and lime, heated to about whiteness, and afterwards tested for Prussian blue; gave none.

FOURTH EXPERIMENT.

Iron, carbon, and lime, treated as the materials of the last experiment; gave no Prussian blue.

From experiments two, three, and four, it was certain that the salt played some important part in the production of cyanogen. As I did not purify the common salt from the sulphate which it, perhaps, invariably contains, was sulphate of soda the active substance?

FIFTH EXPERIMENT.

Iron, sulphate of soda, lime and charcoal, heated nearly to whiteness, yielded an abundance of Prussian blue. The solution, on the addition of the acid, gave off much sulphuretted hydrogen. This process is so productive, that it will, perhaps, be employed as the most convenient source of cyanogen.

In the foregoing experiment is the iron decomposed, its equivalent being $14+2$? Or, is the nitrogen derived from the calcium, its equivalent being = nitrogen + carbon nearly?

SIXTH EXPERIMENT.

Carbonate of soda and charcoal, strongly ignited, gave much Prussian blue.

Here, then, cyanogen is obtained without either iron or lime being present, hence they cannot be concerned in its production. The elements present were carbon, sodium, and oxygen. Is the cyanogen in any way derived from the sodium?

SEVENTH EXPERIMENT.

Lime, sulphate of potassa, iron and carbon, strongly ignited, gave Prussian blue.

Therefore, sodium is not necessary to the production of cyanogen. But it will be seen, that in all cases in which cyanogen has been produced by the foregoing experiments, there were present, in some shape or other, oxygen, carbon, and an alkali, or earth producing metal, and when these conditions are complied with, cyanogen is invariably furnished, if carbonic oxide can be produced.

With regard to experiments five and seven it seems to me most probable, that, at a high temperature, lime decomposes the sulphuret of potassium, or sodium, forming $M+O$ and $Ca+S$.

EIGHTH EXPERIMENT.

Carbonate of soda and iron turnings, strongly heated, yielded Prussian blue.

Assume, now, that nitrogen is an isomeric modification of carbonic oxide, and the whole of the above admits of a lucid explanation.

$$\text{Now}\ \frac{\text{atomic weight of carbonic oxide}}{\text{atomic weight of nitrogen}} = \frac{\text{sp. gr. of carb. oxide}}{\text{sp. gr. of nitrogen}} = 1$$

In applying this explanation to experiment eight, as an example, it must be said that iron at a high temperature effects a transformation something similar to that exhibited by the equations below—

$$\begin{aligned} 3\,(Na+CO^3) &= Na+CO+2C+2Na+\text{ox. iron.} \\ &= Na+\quad Cy \quad +2Na+\text{ox. iron.} \end{aligned}$$

The crucibles employed were the Dutch, and as they have no cover, the materials for the experiment were first rammed in, in such quantity, as to fill about ⅔ of the vessel; the remainder of the space was then generally filled with lime, or a layer of carbon, or iron, and then lime (according as the experiment demanded the absence of either) to exclude the air; the whole was well rammed. The time which the crucibles remained in the fire was fifteen or twenty minutes.

In performing the above experiments I always took care to have an excess of the deoxidising agents, and the materials were intimately mixed in a mortar. The crucibles were from 1½ to 3 inches high.

I have hastened to publish these experiments: they are preliminary to more rigid ones, in which the balance will be used. If I mistake not, the experiments will prove highly interesting to chemists; and they are easily repeated. I have great reason to hope that I shall succeed in transforming nitrogen into carbonic oxide.

REMARKABLE METAMORPHOSES OF GLYCERINE.*

BY J. W. DÖBEREINER.

The composition of glycerine and mannite may be expressed by formulæ which call to mind their saccharine nature, and, at the same time, the chemical constitution of cane and grape sugar, representing the former as hydroguretted cane sugar; $C^6 H^5 O^5 + 2H = C^6 H^7 O^5$, and the latter as hydroguretted grape sugar; $C^6 H^6 O^6 + H = C^6 H^7 O^6$.

As mannite is produced in very large quantity, in the spontaneous fermentation of beet roots and carrots, I was, for a time, led to regard this representation of its composition as correct: I therefore took an opportunity of investigating whether this body may be dehydrogenated and converted into fermentable sugar. With this object, I made oxyphoric platinum and atmospheric air act on a portion of mannite dissolved in the smallest quantity of water, and acted with peroxide of lead on another portion of the same substance. The mannite was metamorphosed by these two agents—the first at a temperature of from 104° F., to 122° F., the second, from 194° F., to 205° F.—not into sugar, but into another substance. The one was converted into an acid resembling gum (yellow, soluble in water, but insoluble in alcohol); the other, into a substance of the nature of acetulic acid, into carbonic acid, formic acid, and gum.

Oxyphoric platinum exerts a still more remarkable action on glycerine than on mannite. If these two bodies be mixed with one another, there almost immediately results a reaction sensible to the touch and smell: indeed, the mixture is considerably heated, absorbs a great quantity of oxygen from the air, and then exhales a vapor of a peculiar odor, slightly acidulated, reddening litmus paper, which is easily condensed, but whose quantity is so small that it is impossible to collect and examine it. After the termination of the reaction, the glycerine was found mixed with the platinum and converted into an acid, which was neither volatile nor crystallizable: this acid, after evaporation from its solution in water, is of a syrupy form; it has an acid and bitter taste; it is soluble in alcohol, and possesses the property of reducing the oxide of silver and protoxide of mercury in solution in nitric acid, when heated with these bodies. I was at first led to take this acid *(glycerinic* or *glycerulic)* for malic or lactic acid; but I afterwards found that its action on the basic oxides distinguishes it more or less from these two acids.

As glycerine acts with platinum in the same way as alcohol, and as it also possesses the property of forming with sulphuric acid a combination similar to sulphorinic acid, it may be regarded, in this respect, as an *analogue of alcohol or amylol*, &c., and, it may be admitted, if it be thus, that in its oxidation or acidification (by platinum) it will absorb, like each species of alcohol, 4 eq. of oxygen, with which it will form 3 eq. of water, and 1 eq. of acid, $C^6H^4O^6$, because $C^6H^7O^5 + 4O = 3HO + C^6H^4O^6$.*

I have not at the present time sufficient glycerine to verify the accuracy of this opinion, and to continue my investigations; I must therefore beg my readers to regard this communication only as a "*prendre date*" of the French.

N.B. By oxyphoric platinum, I do not mean spongy platinum, but the preparation previously known under the name of *ethiops of platinum*, or *black of platinum*, which I have recognised as the oxyphorus which absorbs oxygen with most force.

ON THE PRODUCTS OF THE DRY DISTILLATION OF DRAGON'S BLOOD.†

BY MM. GLENARD AND BOUDAULT.

Dragon's blood, submitted to the action of heat, is at first fused, and abandons acid water which distils at 410° F.; beyond this temperature, the mass swells up and enters into decomposition: it disengages carbonic acid and oxide of carbon. Thick white vapors arise and are condensed, in the receiver, in which is collected at the same time an oleaginous liquid of a red color: a very considerable quantity of charcoal remains in the retort. The liquid obtained is divided into two layers: one aqueous, with an acid reaction on litmus; the other lighter, is a mixture of two oils holding in solution a kind of tar, and presenting some analogy with the products of pit-coal.

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* *Journal für Praktische Chemie.*

* An acid of this nature might be regarded as a combination of formic acid, C^2HO^3 and acetic acid, $C^4H^3O^3$ for $C^2HO^3 + C^4H^3O^3 = C^6H^4O^6$.

† *Comptes Rendus*, No. 11, Sept. 11, 1843.

In distilling this liquid, three very distinct bodies are obtained: an oil lighter than water, an oil heavier than water, these two oils holding in solution a resinoïd body; finally, crystals appearing to be naphthaline or some analogous body. A pitch of a blackish red color remains in the retort.

The light oil was distilled twice with water to free it from the second oil, and a third time over chloride of calcium to separate it from the white resinoïd body. This oil, thus purified is a hydrocarbon; we have given it the name of *dracule.* It is colorless, and has an ethereal odor. Specific gravity = 0·877 at 72° F. It boils at from 257 to 260° F. A cold of — 15° F. does not cause it to undergo any change; insoluble in water, soluble in alcohol, ether, the fat and essential oils, it burns with a smoky flame, and distils without alteration. Its composition, given by analysis, is $C^{16} H^{10}$: the density of its vapor, furnished by experiment which coincided with that furnished by calculation, is 3·7, and represents 4 volumes of vapor.

Potassium has no action on dracule. Hydrochloric acid is absorbed, producing solid camphor. Sulphuric acid dissolves dracule by aid of heat. It may be distilled over potassa without alteration.

Submitted to a current of dry chlorine, dracule absorbs a large quantity of this gas, producing heat and disengaging hydrochloric acid, and is converted into chlorodracule, whose formula, $C^{16} H^{6} Cl^{4}$, indicates that four equivalents of hydrogen have been substituted by four equivalents of chlorine.

ACTION OF FUMING NITRIC ACID ON DRACULE.

The action of fuming nitric acid on dracule varies according to the proportions of acid employed and the temperature at which the reaction is effected.

By causing from 6 to 8 parts of fuming nitric acid to act on 1 part of dracule with the aid of heat, a red solution is obtained, which, concentrated to a certain point, becomes, on cooling, a kind of yellowish magma. This body, treated by boiling water, yields to it a crystallizable acid compound, whilst a kind of oil is separated from it and collected at the bottom. This oil, purified by a distillation with water, has the odor of bitter almonds. It is heavier than water; it has a sweet taste; it is insoluble in water, soluble in alcohol, ether, and potassa; it burns with a smoky flame. Treated by potassa, it gives ammonia and hydrogen. An alcoholic solution of this oil, treated by a solution of potassa, becomes a crystalline magma. These last two reactions seem to make it analogous to hydruret of benzoïl, but the presence of nitrogen renders it a different body.

The acid body dissolved in boiling water is that which we call nitrodraculic acid. It is obtained pure by several crystallizations in water. It is white, shining, and crystallised in small needles grouped in stars; sparingly soluble in cold water; boiling water dissolves only a small quantity of it; it is very soluble in alcohol. Heated on a sheet of platinum, it leaves a very slight residue; it sublimes in fine needles.

The composition of this acid may be represented by $C^{16}H^{6}O^{4}(N^{2}O^{4})$.

It acts with bases like a weak acid, and displaces carbonic acid.

The alkaline salts are all soluble; the others are insoluble or sparingly soluble.

The alkaline salts may be obtained either directly or by decomposing a carbonate.

The others are made by double decomposition, or by boiling the acid with an oxide or a carbonate.

Nitrodraculic acid produces in the salts of iron at the minimum a white precipitate which becomes red by boiling. It does not precipitate the salts of iron at the maximum.

The nitrodraculate of copper is in the form of a green powder insoluble in water and alcohol; it is obtained by heating acetate of copper by a solution of nitrodraculic acid.

The salt of lead is obtained by boiling an excess of carbonic of lead with nitrodraculic acid; it crystallizes in fine and perfectly white radiated needles; it is very soluble.

The salt of silver is obtained in the same manner; it is in the form of very soluble mameloeis crystals.

The nitrodraculates detonate when they are heated. The acid is precipitated from its saline solutions by the powerful acids.

ON THE PREPARATION OF THE IODIDE OF POTASSIUM.

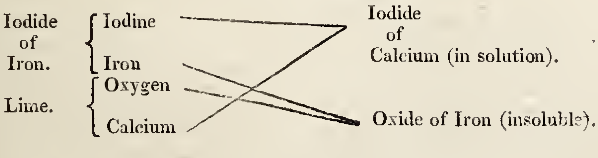
BY LEWIS THOMPSON, M.R.C.S., ROYAL POLYTECHNIC INSTITUTION.

Although an active medicine, the iodide of potassium is rarely met with in a state of purity: this perhaps would be a matter of secondary importance, provided the adulterations were uniform in regard to quantity and quality; but when we find these contaminations varying from five to thirty per cent., and consisting of various mixtures of carbonate and sulphate of potassa with chloride of potassium, it is evident that the medical practitioner must labor under an unnecessary difficulty in apportioning the dose of this compound; to obviate this, and to afford a cheap and certain mode of preparing the iodide of potassium in a state of great purity, the present process has been contrived; no other method is now used in the extensive laboratory of this institution, and its operations are here found to be as economical as they are simple in a practical point of view.

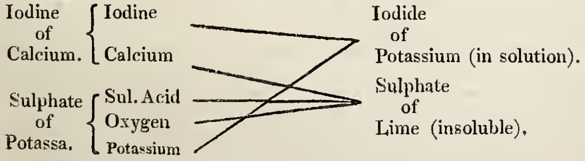
Before commencing the manufacture of iodide of potassium, it is necessary to ascertain the amount of impurity contained in the iodine about to be employed; this will be found to vary from three to twelve per cent., and to consist chiefly of water and sulphur. To assay iodine, let 100 grs. of it be placed in a flask with about an ounce of distilled water, then add to these not less than 100 grs. of zinc, which has been melted and poured out on a cold slab, so as to form a thin plate; the common sheet zinc will not answer, as it contains a large quantity of lead; having added the zinc, the flask must be closed with a cork, and shaken occasionally during two or three hours, or until the dark brown color of the iodine has disappeared, and the liquor remains clear and colorless like water; the zinc must then be taken out and well washed, dried, and weighed; its loss will give the quantity of iodine existing in the sample, every grain of zinc lost indicating about four grains of iodine.

Having thus determined the per centage of iodine, weigh out a given weight of it, and digest with water and iron or zinc in the usual way, so as to obtain a solution of the iodide of iron or zinc, which must be mixed with an excess of slaked lime; then heat the mixture for half an hour, throw the whole in a filter, and wash this repeatedly with warm water; mix the filtered liquors, and add well dried sulphate of potassa in the proportion of ten parts of sulphate for every fourteen parts of iodine contained in the sample; boil for one hour; then filter and evaporate so as to obtain crystals, which may be freed from the small quantity of sulphate of lime with which they are contaminated by a second solution and crystallization. In this way an excellent marketable article may be obtained, wholly soluble in alcohol, and exerting no alkaline reaction on turmeric paper. The accompanying diagrams may perhaps assist in explaining this process:—

FIRST PROCESS.



SECOND PROCESS.



ON THE ACIDS OF THE GASTRIC JUICE.*

BY C. ENDERLIN, M.D.

A criminal having lately been executed at Giessen, an opportunity was afforded me of subjecting the contents of the stomach to some experiments. Twenty-four hours after the beheading, I obtained it through the kindness of Professor Wilbrand. It was for the most part in a finely divided state, and presented the appearance of a reddish pulpy mass, and contained intermixed some particles of green beans, which were unaltered. The red color seemed to have been produced by red wine.

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* *Annalen der Chemie und Pharmacie.*

It had a pretty strong sour taste, was astringent, and of a disagreeable odor; it reddened blue litmus paper. I exhausted it perfectly by hot water, filtered the solution from the undissolved residue, and distilled the filtered product over a gentle fire in a phial to the consistence of a thick syrup. At the end of the operation, the action of the fire was rendered still more moderate, in order to avoid any decomposition of the residue. To a small portion of the distilled liquid, which reddened litmus, I added one drop of nitrate of silver, which rendered the liquid turbid, without any sensible precipitate.

I then added to the whole of the remainder three drops of pure caustic potassa, concentrated it by evaporation, then acidulated it with a few drops of nitric acid, and added nitrate of silver. A pretty considerable precipitation ensued. The precipitate, carefully washed, dried and fused in a porcelain crucible, weighed 0·157gr., which quantity of chloride of silver answers to 0·040gr. muriatic acid.

Besides muriatic acid, the distilled liquid contained butyric acid, but not a trace of acetic acid. The residue was taken from the phial, and the vessel was washed; the liquid, which still exhibited a powerful sour reaction, was neutralised with carbonate of soda, evaporated to dryness, and extracted with ordinary alcohol.

I poured a few drops of sulphuric acid into the alcoholic solution, and filtered the sulphuric salts from the precipitate. I diluted the filtered liquid with water, digested with newly prepared carbonate of baryta until all reaction ceased. The liquid was separated by filtration from the precipitate, the latter was carefully washed with water, and a solution of sulphate of zinc was added to the solution so long as it produced a precipitate.

The filtered liquid, concentrated to the consistence of a syrup, did not deposit any crystals of lactate of zinc, but it contained chloride of zinc. The liquid of a syrupy consistence was entirely dissolved by alcohol. The contents of the duodenum likewise presented neither lactates nor acetates.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

REPORT OF THE SELECT COMMITTEE ON SMOKE PREVENTION.

The publication of the evidence laid before the Select Committee appointed to inquire into the Means and the Expediency of Preventing the Nuisance of Smoke, arising from Fires in Furnaces, is too late this month to admit of our doing more than briefly noticing a few particulars, and promising a more lengthened examination of this voluminous and valuable report next month.

The appointment of this committee was ordered on the 27th of June, and its meetings, commencing July 13, were held weekly, and closed on the 15th August with the reports of Drs. Ure and Reid, giving their respective chemical views of the subject, arising out of the evidence adduced.

Having last month noticed the Smoke Nuisance question, and in our present number introduced a paper brought before the Chemical Section of the British Association at Cork, in both of which articles the chemistry of combustion is not only dwelt upon, but the peculiarly favorable construction of the Argand furnace, invented by Mr. C. W. Williams, particularly mentioned, we naturally looked to the report for the confirmation of our preconceived views, and have been most agreeably surprised at the tone of the evidence now given compared with that before a similar committee, of which MICHAEL ANGELO TAYLOR, Esq., was chairman, in 1819: then *smoke* was to be burnt by causing it "to return into the heat of the fire before it enters into the flue or chimney;" now it is proposed to prevent it by burning the *gas* with a supply of air.

Among the witnesses examined the evidence of HENRY HOULDSWORTH, Esq., an extensive cotton spinner at Manchester, is decidedly the most practical and interesting. It appears he has three of Mr. Williams' Argand furnaces, and that the principle of the invention was discussed at the Manchester meeting of the British Association. He says (p. 106, No. 1128), "The subject was first discussed in the mechanical section, and was then brought under the notice of the chemical section by Mr. Williams. On that occasion the practical men present, including myself, sought for the opinion of the chemical authorities present, as to the necessity of the *introduction of air to the gases*, as a means of *preventing smoke*, and there was but one opinion expressed by the chemical authorities present, including men of known eminence,* that without the admixtnre of atmospheric air or oxygen to the gases, it was impossible to prevent the formation of smoke." This is to the point, and yet only what we should have expected. Mr. Houldsworth has supported his statements of the economy of the process by several ingenious pyrometric diagrams.

We were also particularly struck with a remark in the course of the evidence by Mr. John Dewrance, resident engineer of the Liverpool and Manchester Railway: "I have had," he says, "an opportunity the last ten years of examining various plans, and I have never seen any that have been at all successful until Mr. Williams's was introduced; and since that, I think all the plans tried before that have now become successful; but they are all from pirating more or less his plans; it is easy to see that."

Mr. Williams's furnace, from not being a mere piece of mechanism, is of very extensive application; jets of air may be introduced into almost any fire or furnace, but not so with revolving grates, fans, hoppers, a shower of water, and the like; they are not generally applicable to existing furnaces.

We shall return to this subject next month, when we propose giving a full analysis of the entire evidence.

MEMOIR ON THE ELECTRO-CHEMICAL APPLICATION OF OXIDES AND METALS ON METALS.†

BY M. BECQUEREL.

(*Concluded from p.* 461.)

Hitherto, no regard has been paid to temperature, or at least the experiments have been regarded as having been made at the temperature of the atmosphere; but, by operating at about 77° F., as I have done several times, the deposits are more firmly fixed; because the dilatation which the parts undergo allows the molecules of the peroxide of lead or iron to be deposited in the superficial interstices. It is very evident that the tints may be varied *ad infinitum;* for example, we may deposit on gold and silver more or less thick coats of peroxide, and agreeable shades may thus be obtained. It is probable that other oxides might be deposited on metals; but, in my work, I have confined myself to two.

I will here make some observations which may not be without utility.

It has been seen that I operated with a vessel filled with acidulated water, in which the diaphragm containing the alkaline solution was plunged: would it not be possible to dispense with the diaphragm, and to operate immediately on the alkaline solution, by taking a sufficient number of constant couples? This could not be done, because the deposit being affected at the positive pole, a portion of the metal would be deposited on the negative plate, so that the solution would soon contain no metal. Indeed, this inconvenience exists, but in a less degree, in the simple apparatus, in consequence of the effects of endosmose, which carry the oxide of lead into the acidulated water; but it might be in a great measure remedied by using only a single liquid: in this case, the same alkaline solution is put into the vessel, minus the metal, which is found in the diaphragm; but then a greater number of couples will be required, because we shall no longer have a liquid so easily decomposable as nitric acid to furnish oxygen.

The alkaline preparation is very important; I have nothing to add to what I have previously said concerning the solution of protoxide of lead in potassa. With regard to the ammoniacal solution, I will point out some precautions necessary for preventing it from being rapidly decomposed; and, in order that it may be very clear, ammonia as concentrated as possible is put into a bottle, and protosulphate of iron, deprived of air, is added until a precipitate is formed; it is sealed with emery, the deposit is allowed to settle, and a solution as clear as possible is obtained, which may thus be kept for a long time.

Dry scouring, for the application of metals, is, doubtless, preferable to scouring by the humid process; but, as the fatty matters which sometimes adhere to the surface of the iron in consequence of the contact of the fingers, injure the deposit, it is advisable to dip the objects into very concentrated sulphuric acid, and to wash them in a bath of potassa before steeping them in the alkaline bath. We might confine ourselves to leaving the objects immersed, for some time, in a bath of concentrated potassa, because this bath preserves the iron from oxidation; by following this method, I have sometimes found the objects covered with peroxide, which resisted the action of dilute sulphuric acid, which suffices to show that they would have been unattackable by atmospheric influences.

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* The much revered Dr. Dalton presided at the meetings of the chemical section.

† *Comptes Rendus*, No. I., July, 1843.

Although everything tends to show that we might apply to the arts the process which I have just pointed out, for depositing the peroxides of lead and iron on the metals in daily use, in order to preserve them from alteration by external agents, deposits which cannot fail to produce good effects, on account of the unalterable nature of these oxides, and especially of the peroxide of iron; nevertheless, I am far from believing that no more investigations are required in order to bring this process into common use. I know from experience that there is a great distance between the principle and its application; my object, in this memoir, is to make known the principles, leaving to practical men the task of applying them. I wished only to prove that the thing was possible. The various objects, which I exhibit to the Academy, will show how far my assertions are founded. Among these objects are several flowers, all of whose parts have been electro-chemically covered, some with gold, others with silver, with peroxide of lead, or peroxide of iron, with their different shades, the whole tastefully arranged by M. Mourey, who is favorably known to artists, and who has recently discovered a very simple means of preserving electro-chemical silvering from the alteration which it undergoes in contact with light, when it has not been subject to any preparation, and of thus preserving all its lustre.

II. ON THE ELECTRO-CHEMICAL APPLICATION OF METALS ON METALS.

OF ADHERENCE.

The application of oxides and even of metals, on metals, with adherence, depends not only on the state of the surfaces, but also on the solutions and on the intensity of the current which decomposes them; the examination of all these causes is, therefore, of high interest at the present time, when all minds are directed towards these applications; it is for these motives, and in order to complete the subject which I have just had the honour of treating of before the Academy, that I take the liberty of communicating to it also the result of my observations in this examination.

Experience proves that in general the adherence of the oxides and of the metals, gold, silver, copper and lead on metals, is greater as the intensity of the current is less, within certain well known limits, and as the solution is less concentrated. Such is the proposition which I am about to develope.

It is known that to a certain point currents of feeble intensity produce a strong adherence, whilst with energetic forces, the deposits become less and less coherent. When the deposition is very slowly operated, the molecules crystallise tranquilly; the body is constituted according to the laws of crystallization, whilst, when the force augments in intensity, the crystallization becomes more and more tumultuous and confused, and the deposit is finally composed of parts which have little or no adherence.

Four or five years before gilding and galvano-plastic were thought of, I obtained in the electro-chemical treatment, in the large way, of the ores of silver, copper, or lead, sometimes very adherent deposits of these metals on bodies destined for collecting them, effects which I did not make known in the public lectures in which I gave a general idea of the processes employed, because I reserved the publication of all the particular facts for a work which will very soon appear. These deposits constitute true silvering and leading, and I then ascertained that the adherence of lead, copper and silver was so much stronger as the solutions were more dilute and the current weaker; these observations date from eight years ago. The adherence of lead on large plates of copper was so great, that it was necessary to employ sharp instruments to remove it, and it was also effected only by cutting the copper, so that it might be said that there was really a combination of the two metals in contact. All who have followed my experiments, and I may mention in particular M. Saint-Clair Duport, have observed the same. Indeed, in the electro-chemical gilding, with which I have been occupied since De-la Rive, Elkington, and De Ruolz, this effect has always been presented to me. Unfortunately, the principle which I have just enunciated cannot be put in practice, because quickness and economy are required in the arts. Nevertheless, a useful consequence is drawn from my experiments, namely, that by employing an energetic current, we lose in adherence, and the gilded or silvered objects are inferior in quality as regards durability.

It cannot be said, that, in electro-chemical gilding and silvering, as at present practised, there is a combination by contact; there is produced only an effect of aggregation and of cohesion, which may always be overcome by physical forces, which is not the case with chemical effects; hence, the thicker the layer of metal deposited, and the greater the difference of dilatability between the metal which receives the deposit and the deposit itself, the more the variations of temperature will tend to separate them from one another, because the result of the effects of dilatation is so much the more considerable as the quantity of matter deposited is greater.

There are, likewise, several causes which tend to produce this effect; particularly the mode of scouring employed in the new modes of gilding on copper. This preparation consists in steeping the copper objects before their immersion in the solution of gold, in one or more mixtures of concentrated or diluted acids, then several times in water, in order to remove all the bodies which remain on their surface; but a few seconds always elapse between the objects leaving the last water bath, and their immersion in the solution of gold. Frequently nothing more is required for the object to be altered in the air; this alteration is indeed very slight, but still it exists.

Hence it follows that the deposit of gold is not effected, strictly speaking, on a surface of pure copper, but on an excessively fine pellicle of oxide. Scouring by the humid way does not therefore put metallic surfaces in the fittest state for the adherence to be as firm as possible; scouring by the dry way has not the same inconvenience, since the surfaces may be exposed without fear of so immediate an alteration as when they are humid. Indeed, in the investigations recently made relative to gilding by immersion, the following modes of scouring were employed:—

I. By rubbing only with very finely powdered pumice-stone and a brush, or else by scraping the surface with a sharp instrument.

II. Scouring with nitric acid, and with mixtures of this acid with common salt and soot.

III. Scouring with a solution of caustic soda, marking 7 degrees of Baumé's areometer, and with solutions marking 30 degrees.

IV. Scouring with solutions of soda and ammonia.

V. Scouring with a mixture of caustic soda and sal-ammoniac.

VI. Scouring with a mixture of concentrated acid and common salt.

To ascertain the adherence of gold to plates of brass, the following trials were made:—one side of each gilded brass-plate was cut, in order to facilitate the separation of the gold, in cases where the adherence was not perfect. With the same view, the plate was afterwards bent in different directions, and then hammered. The following are the consequences drawn from these trials, which consequences may likewise apply to electro-chemically gilded objects, after the indicated scourings.

With scouring by the dry way, durability and solidity are obtained for the gilding: durability, because it is thicker; solidity, because it resists the physical tests which it is made to undergo. It must be observed, indeed, that the appearance is not always satisfactory, especially when the surface has not an uniform state. It is thus demonstrated, that scourings by the dry way are greatly superior to those by the humid way, but unfortunately there are in many, and, indeed, most cases, and that is the greatest number in which it cannot be employed, in articles of jewellery among others, and even when it might be used, the time which it would require would be so burthensome an expense, that it could not be used in industry: it is therefore necessary to scour by the humid way, avoiding, however, the inconvenience above noticed.

The employment of mercury removes this difficulty: besides it serves as an intermedium between the copper, gold and silver, for determining the combinations by contact; it also preserves the copper from all alteration before immersion in the metallic solution.

M. D'Arcet, who has been successfully occupied with all that concerns the art of gilding, has long since indicated, that, in order to avoid the disengagement of nitrous gas, for the sake of salubrity, it was necessary to steep in a dilute solution of protonitrate of mercury the scoured objects destined to be gilt by mercury. It is evident, indeed, that it becomes by this means more easy to apply gold on the objects. Mr. Elkington, in his specification, has recommended the same means in gilding by the humid way for giving the *matt* after previous scouring in the acids; but he confines himself only to a single immersion and one washing previous to steeping in a boiling bath of gold; he can only imperfectly amalgamate the surface of the copper, on account of the short duration of the immersion.

The following is the manner in which I amalgamate the pieces, in order to have the best effects of gilding, with respect to durability and solidity. When the objects have been simply immersed in the solution of protonitrate of mercury, and washed with a large quantity of water, they are rubbed with leather, in order to diffuse the mercury, and the immersions are repeated until the metal is equally diffused over the surface. If it be slightly spread without rubbing, the surface remains tarnished; if it be *brushed*, it assumes a brilliant appearance. The pieces being thus prepared, if they be steeped in the bath of cyanide of gold and potassium, at a temperature of 77° to 86° F., and setting the constant battery in operation, in less than a quarter of an hour the objects are gilded, either *dead (matt)* or shining, but of a *matt* to a certain point comparable to that of clocks, a quality difficult to obtain with the process in use. If it be wished to give value to electro-chemical gilding, we must employ jointly both methods, and take mercury as a medium, but not in so great a quantity as in gilding by mercury. The temperature of the operation for bringing up the color is sufficient to drive off the mercury, so that the advantages are united of the combination of the gold with the copper, and of an almost unlimited thickness of gold.

It is easy to explain how electro-chemical gilding on copper, when the coat is very thin, eventually alters by contact with moist air. Under such circumstances, here and there are seen little points of hydrate of copper; an effect equally evident in gilding by immersion, where only a thin layer of gold is deposited. If an article thus gilded, by either of the two processes, be digested in nitric acid, diluted in order to avoid a tumultuous action, the copper is dissolved by degrees, and there remains a net-work like gauze; the articles are therefore covered with a similar network, and, if they be left in a moist place, they must, in course of time, be attacked in the same manner as they were by the diluted nitric acid.

The effect must be even more rapid than if the copper were alone, the surface being everywhere covered with voltaïc pairs, gold and copper, the constant action of which accelerates the oxidation of the copper. There is no need to fear the same inconvenience by following the path I have just pointed out, for the surface of the copper may be uniformly gilded, and, if the coating be thick, as it may be rendered, by electricity, we have every guarantee of the unalterability of the coated metal. It must never be lost sight of, that, in the application of gold on copper, or of one metal on another, two conditions must always be united—adhesion, and sufficient thickness of the deposited coating, that the atmospheric influences may not exercise their action on the metal, through the innumerable interstices that are left between the particles of deposited metal.

ON THE ASPECT OF GILDED OR OTHER SURFACES.

Before the electro-chemical application of metals or their oxides, scouring and pickling were employed; the object of the latter operation was not only to remove all impurities, but also to give them an aspect according to the molecular state which was desired to be obtained on the surface: thus, if the *brilliant matt*, the *dull matt*, the *dull sombre*, be required, the preparation in question must vary in the different cases. Different means are known in the arts by the aid of which these preparations are made. I will offer a few considerations on the physical causes which produce the different molecular conditions, because it will then be easier to adopt the course to be pursued in order immediately to obtain the *matt*, the *polish*, &c.

The *polish* of a surface consists in the property it possesses of reflecting the light regularly on certain points, which requires that this surface be composed of particles all arranged in the same manner, that is, having their upper facets placed in the same plane. By this means the reflection of light is regular.

The *matt*, on the contrary, appears to be the result of the irregular reflection of light—a condition which is complied with when the surface is covered with an infinity of little asperities, whose facets are determined in all sorts of directions. It follows that exterior objects are reflected by this surface, with a greater or less degree of confusion. There is entire absence of image when the particles are arranged in the most irregular manner possible.

This being understood, when a metallic surface, either polished or matted, is submitted to the uniform action of an electric current, in a solution, in order to be covered with an excessively thin layer of gold, silver, or other metal, it is very evident that the primitive state of the surface will not be sensibly changed; for, in the former case, that in which the surface is polished—all the regularly situated parts of the surface will be respectively covered with a film, that, on account of its thinness, will not change the primitive molecular state; in the second case, that is with the *matt* surface, the irregularities will still preserve their same relation; for there is no cause why this situation should be changed. It is very evident that this state of things can only subsist as long as the deposit is excessively feeble; for, if it were sufficiently abundant, it would fill the voids which separate the irregularities, and then the state of the surface would change.

Thus, then, when a metallic surface of gold, silver, copper, or zinc, is prepared so as to present the polish, or the matt with all its shades, we may be assured, that, on depositing on it another metal electro-chemically, in a very thin film, the molecular state of the surface will not be sensibly changed.

The considerations I have just presented will suffice to shew plainly how any desired molecular condition may be immediately obtained. In fine, they may be summed up in this:—as is the surface, so is the gilding.

In a future memoir I will describe the

mode of preparation which each metal should undergo before placing another metal on its surface.

ON THE FORMATION OF FAT IN ANIMALS.

(Concluded from p. 414.)

M. Boussingault observed, that no conclusion applicable to the question under discussion could be drawn from his former investigations. "At the time," said he, "when I made my first experiments, I had it solely in view to study the influence of nourishment on the production of milk, considered with regard to quantity; all these experiments being directed under this purely practical point of view, I neglected to determine the matters soluble in ether, which might be met with either in the aliments consumed, or in the excrements voided by cows. I confined myself to estimating the butter in the milk collected. In order to profit by my former experiments, it would be necessary to be convinced that the chemical composition of provenders remains always the same; now, no practical man will partake in this conviction; there is not a breeder who does not know how greatly the quality of the same provender varies, according to the years or the soils in which they have been gathered. As regards hay, every one knows that its nutritive faculty may vary from simple to double. With the view of elucidating the question under consideration a special and direct experiment was required, and we did not wait to make it until this discussion was raised. The relation of this experiment forms part of the documents placed at the end of the memoir read by M. Payen. The observations were made at Bechelbronn; the analysis executed at Paris; and all the matters are preserved, and at the disposal of chemists who may desire to control our results. These observations were to have been printed in the *Annales de Chimie*, but I thought I ought to deposit them on the *bureau*, in order that they may be inserted in the *Comptes Rendus*.

On this occasion I will request of the Academy permission to explain to it in few words how I have been led, on my part, to occupy myself more particularly with the fatty principles contained in provenders, concerning the part acted by which M. Dumas and myself have explained our opinions in a formal manner. The Academy will recollect that, some years ago, I had the honor of communicating to it investigations concerning the alimentations of the herbivora. In these investigations I have established that aliments appear to be so much the more nutritious as they contain a larger proportion of nitrogen; I had deduced from them a table of nutritive equivalents which was collected with kindness, and, I doubt not, with some profit, by the cultivators. In extending these investigations I was brought to compound the ration of a milch cow, with roots only. I knew previously that with a ration of this nature I could feed a working ox or a horse. Our cow-herd augured very ill from this ration, because I had suppressed the few kilogrammes of chopped straw, or husks of wheat, which are ordinarily added to the roots. The anticipation was verified—the cow suffered from the new regimen. It was then that I thought of rendering an exact account of the intervention of the fatty or waxy principles which form part of the provender, and particularly the husks of cereals. which I had suppressed. I was then completely ignorant that my honorable colleagues, MM. Dumas and Payen, were at the same period occupied at Paris with the same subject.

However, as Professor Liebig is well convinced, here, as on all other occasions, practice has outstripped theory, for the very universal custom of using oily cakes, and oleaginous seeds in the nourishment of milch cows and animals to be fattened, is strong presumption in favor of the opinion which we sustain. I will even add, in all humility, that, in my eyes, this practice is an argument of much greater value than all those we could draw from investigations made in our laboratories.

In examining the detail of the experiment made at Bechelbronn, it will be seen that the cow which formed the subject of the observation, had arrived at the state when the production of milk remains nearly constant. This is an important point in investigations of this nature, and to which I shall probably have occasion to recur.

The cow experimented on was *Esmeralda*, No. 6, of the stable of Bechelbronn; she had calved on the 26th of September, she was covered on the 4th of November. Until the 22nd of January (inclusively) this cow received the ordinary ration, then composed, for the 24 hours, of

After grass of hay . .	5	kilogrammes.
Cakes of colza	1	,,
Turnips	3	,,
Husk of wheat	1	,,

Esmeralda produced in milk, under the influence of this nourishment, in the month of January:—

	Milk in 24 hours. lit.
January 1 . . .	7·50
,, 2	7·00
,, 3	7·00

	Milk in 24 hours.
	lit.
January 4	7 00
,, 5	6.50
,, 6	6·00
,, 7	7·00
,, 8	7·50
,, 9	7·00
,, 10	6·00
,, 11	6·50
,, 12	7·00
,, 13	6·50
,, 14	6·50
,, 15	7·00
,, 16	6.00
,, 17	6·50
,, 18	6·00
,, 19	6·50
,, 20	6·50
,, 21	6·00
,, 22	6·00

The average produce in milk, during the eight days preceding the experiment, was 6·30 kil. per 24 hours.

From the 23rd of January, the ration consumed by the cow, was—

Hay. . . .	7·50	kilogrammes
Chopped wheat straw	4·50	,,
Beetroots . .	27·00	,,

Each day we took for analysis a sample of each of the aliments.

With this regimen the milk rendered was—

	Milk in 24 hours.
January 23 . . .	6·50
,, 24 . . .	6·00
,, 25 . . .	6·00
,, 26 . . .	6·00
,, 27 . . .	6·00
,, 28 . . .	6·50
,, 29 . . .	6·50
,, 30 . . .	6·50
Mean of eight days . .	6·03

The milk rendered was evidently the same as before the new ration.

The estimation of the excrements rendered by the cow lasted four days, from the 24th to the 27th of January. To facilitate this estimation, the cow was put into a stall, the floor of which was covered with flag-stones.

The humid dung was weighed every evening; after having been well mixed, a sample weighing 500 grammes was taken and afterwards dried on a stove. Thus was ascertained the quantity of dry matter contained in the humid excrements.

PRODUCTS RENDERED BY THE COW IN 24 HOURS.

Dates.	Humid excrements.	Weight of the sample before being dried.	Weight of the dried sample.	Dry matter per cent.	Dry excrement rendered in 24 hours.	Milk rendered during the estimation.	
	kil.	grammes.	gram.	gram.	kil.	lit.	
Jan. 24.	18·500	500	84·6	16·8	3·108	6	6·180
,, 25.	19·000	500	88·4	17·7	3·363	6	6·180
,, 26.	23·250	500	88·5	17·7	4·115	6	6·180
,, 27.	19·750	500	82.5	16·5	3·259	6	6·180
	80·500				13·845	24	24·720

To estimate the fatty or waxy substances contained in the aliments consumed, and in the products rendered, these different matters were first treated by boiling water, then dried, in order to submit them, first to the action of ether, and afterwards to the action of a mixture of ether and boiling alcohol.

As regards the beet-root and humid dung, we acted on these matters when dried; hay and straw were not previously subjected to desiccation; they were divided as finely as possible; then, after the first treatment, hey were reduced to powder before being again made to undergo the action of the solvents.

The proportion of fatty matters contained in milk was determined by the method pointed out by M. Peligot.

ALIMENTS.

		Fatty matters per cent.
Hay . . .	First experiment	3·6
	Second experiment	3·9
Straw . . .	First experiment	2·4
	Second experiment	2·0
Beet-roots (1) not dried		0·1

PRODUCTS.

		Fatty matters per cent.
Dried excrements	First experiment	3·3
	Second experiment	3·9
Milk		3·7

We may therefore adopt for the proportions of fatty matters :—

	Per cent.
Hay	3·7
Straw	2·2
Beet-roots	0·1
Dry excrements	3·6
Milk	3·7

SUMMARY OF THE EXPERIMENT MADE AT BECHELBRONN.

Aliments consumed by the cow in four days.			Products rendered by the cow in four days.		
Nature of the aliments.	Weight of the aliments.	Fatty matters contained in the aliments.	Nature of the products.	Weight of the products.	Fatty matters contained in the products.
	kil.	gram.		kil.	gram.
Beetroots	108	108	Milk.	24·720	915
Hay	30	1100	Dry excrements	13·845	498
Straw	18	396	Fatty matters of the products	....	1413
Fatty matters of the aliments	....	1614			
Fatty matter fixed or burned	....	1413			
		201			

After some remarks from M. Gay-Lassac, M. Dumas felt compelled to call to mind that Professor Liebig had sent to Paris an article in German, after his letter of March 6—in fact, his letter of this day.

In the German article, which M. Gay-Lussac appeared not to know, Professor Liebig states that M. Boussingault obtained from a cow which eat 7 kil. 500 of hay and 15 kilogrammes of potatoes, 64 lit. 92 of milk containing 3,116 grammes of butter; that from a second cow, which consumed 7 kil., 500 of after-grass, and 15 kilogrammes of potatoes, M. Boussingault obtained 4,000 grammes of dried excrements.

Professor Liebig, having analysed hay of Giessen, and the dung of a Giessen cow, calculates from that, that the first cow of Bechelbronn received 756 grammes of fatty matter in six days, and that the second cow of Bechelbronn received 747; and he asks whence come the 3116 grammes of butter produced by the former.

This combination of several experiments in one appeared to us valueless. I have reason to say so; and it is only astonishing to me that the cow belonging to Mr. Koch, now under consideration, furnished precisely in six days 64·92 of milk, containing 3,116 grammes of butter, and per diem 4,000 grammes of dry excrements, like the two preceding, and there should still be a question concerning the 756 grammes of fatty matters in the aliments, and of the 747 grammes of fatty matters in the excrements which had been admitted for the two cows of Bechelbronn.

To avoid all new difficulty on this subject, I here give the literal translation of the first writing of Professor Liebig. It will be seen that no reference is made to the cow of M. Koch, and that all the discussion turns on the experiments of M. Boussingault.

Professor Liebig thus expresses himself:—

"The experiments of M. Boussingault on the influence exerted by the aliments on the proportion and the principles of cows' milk go to furnish us with still more important arguments for establishing that the organism produces fat by means of alimentary substances which are not fats, or which do not contain fat.—(*Ann. de Chimie et de Phys.* t. lxxi., p. 65.)

"The experiments of M. Boussingault merit, I think, entire confidence; it is so much the more incomprehensible to see M. Boussingault associated with men of science who have made an object of doubt and of discussion of the opposite opinion.

"In a series of experiments executed in winter on a cow, by M. Boussingault, the daily ration was 15 kilogrammes of potatoes, and 7 kil. 500 of hay.

"The milk collected during six days was 64 lit. 92, containing 3 kil. 116 of butter.

"In six days the cow received 90 kilogrammes of fresh potatoes, or 19 kil. 88 of dry potatoes, and, moreover, 45 kilogrammes of hay.

"Admitting that the 19 kil. 88 of potatoes furnished the 60 grammes of fatty matter which are contained in it, then the 3 kil. 056 of butter must come from the 45 kilogrammes of hay.

"Hay must therefore contain seven per cent. of fatty matter.

"Now, this may be decided by experiment. The experiments made in my laboratory have shown that the best quality of hay, in the state in which it is eaten by the cow, gives 1·56 of its weight of matter, soluble in ether.

"Supposing that hay contains 1·56 per cent. of butter, 45 kilogrammes of butter could produce only 691 grammes of butter in the cow. It remains to explain the origin of the 2 kil. 365 of butter, which M. Boussingault found in the milk.

"Professor Liebig then renders an account the experiments made in his laboratory for determining the proportion of the fatty matters contained in excrements. The excrements of a cow fed with potatoes and after-grass were submitted to analysis: ether extracted from the dry matter 3 gr. 119 of fatty matter. Then he adds:—

"As it must be admitted, according to M. Boussingault (*Ann. de Chim. et de Phys.* t. lxxi, p. 322), that the solid excrements in the dry state represent $\frac{4}{10}$ of the weight of dry provender, it is clear that those excrements contain the same quantity of fatty matter as the aliments swallowed.

"7 kil. 50 of hay contain (at 1·56 per cent.) 116 gr. of fat. The 15 kilogrammes of potatoes, moreover, contain 10 grammes of fat—in all, 126 grammes. The excrements rendered each day weigh 4 kil.; they contain, at 3·119 per cent., 124·76 of fat.

"A milch cow, which gives in six days 3 kil. 116 of butter, consumes in its aliments 756 gr. of matter soluble in ether; there enters into its excrements 747 gr. of similar fatty matter. It should, then, be concluded that these matters have not taken part in the formation of this 3 kil. 117 of butter."

All the numbers which this article of Professor Liebig contains are therefore obtained from the two experiments of M. Boussingault, as I had advanced; and as they are perfectly identical with those of the letters of which Professor Liebig has addressed to the Academy, we should naturally conclude that there has been no new experiment until he assures us of the contrary.

ON THE PRODUCTION AND PREVENTION OF SMOKE.*

BY HENRY DIRCKS.

The question as to the cause of the production of smoke, its constitution and peculiarities, is one which, I am well aware, might be elaborated into a discourse of considerable length, but it is not my present object to go into these details. The subject is one of considerable importance, particularly as regards the health of towns, and the interests of manufacturers; I consider, therefore, that with this great public benefit in view, the object of this Association cannot be better carried out than by bringing forward, and subjecting to rigid investigation, any practical application of chemical theory which has been found to answer the proposed end.

I may mention that the subject of smoke prevention was first laid before this Association at the meeting in Glasgow, by Mr. Charles Wye Williams, whose views of the chemistry of combustion have been also published; yet it is not a little remarkable that even some who profess a knowledge of chemical science doubt the impossibility of economically *burning smoke.*†

Having had very extensive intercourse with different manufacturers throughout the United Kingdom, I have generally found them doubtful as to what invention, or class of inventions, is most approved, or which theory of the many theories afloat is the soundest. If, therefore, the views now propounded are incorrect I seek nothing more earnestly than their unqualified condemnation; indeed, I am well persuaded that they cannot pass without censure if not chemically correct.

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* In the discussion which followed the delivery of this paper, Mr. William West, chemist, of Leeds, emphatically said, in the course of his remarks, that "*smoke* CAN *be burned*"—and proceeded to ridicule the idea that smoke cannot be burned, which he stigmatised as "one of Mr. Williams's crotchets." He said he had early given a testimonial in favor of Mr. Williams's argand furnaces, every word of which he was still able to support! This quibbling on the part of Mr. West is what we were certainly not prepared to expect from him.

Mr. Dircks replied by observing, that he could as boldly as Mr. West say, that *smoke can be burnt.* He considered, however, that the question before the Section was not whether smoke *can* be burnt; but, whether it is not more correct, more scientific, to *prevent* its formation; to burn the *gas* rather than the smoke.

† *Read before the Chemical Section of the British Association, at Cork,* August 19, 1843.

It will fully answer the purpose of this inquiry to define smoke to be the result of the imperfect combustion of the crude coal gas, eliminated on making each fresh charge of fuel. The black vapor or *smoke* is only seen at the chimney top, and merely differs from the colorless vapor of a chimney not smoking by the deposited carbon of the carbonated hydrogen rendering it opaque. We have thus:—1st. In the furnace the crude coal gas distilling from the fuel, contaminated and colored by coal-tar vapor and other impurities, differing materially from smoke in *quality*, though not much unlike in *appearance*.—2nd. Given off at the chimney, we have the volume of black smoke arising from the incomplete combustion of the crude gas in the furnace and flues, owing to an imperfect supply of air, or oxygen.

It must appear strange to the body of scientific men whom I have the honor of addressing, that a chemical fact of this nature should be disputed to the extent of actually impeding the introduction of what appears scientifically to be the only means of effectually removing the smoke nuisance.

Smoke, then, being nothing more than deposited carbon floating in incombustible gases and vapor, it is our interest to deal rather with the carburetted hydrogen than with the smoke.

In practice, with large engine boiler and other furnaces, all that appears to be requisite is to consider the best mode of applying the air to the crude gaseous products of the coal. The gas not being under control we cannot obtain it conveniently in a divided form, as in the Argand lamp; but we can reverse the principle and divide the air into some hundreds of small streams, jets or films, showering it rapidly into the hot atmosphere of gas in such a manner as to secure intimate mixture. This plan has been extensively practised for the furnaces of land and marine engines, and found to answer in a most surprising and remarkable manner.

A knowledge of the necessity for this arrangement is important to those who seek to abate the nuisance of smoke on an economical system.

This is all I contend for, and I would sum up by making this general statement:—That, to prevent smoke being formed, it is requisite to supply air to the gaseous products of the coal, independant of the supply to the solid fuel in the grate.*

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ON MEDICINAL EXTRACTS.

BY G. M. MOWBRAY.

(*Concluded from page* 472.)

We now come to a consideration of that method of evaporation which has been termed *spontaneous*, and which, if rapidly conducted, equals any method that we have considered; still, the difficulties to be overcome are not trifling.

The most recent modification of this method is that described in the "Pharmaceutical Transactions," p. 638, vol. 2, by Mr. Hooper, and illustrated by a wood engraving. The objections which have deterred me from practising this plan are—

1st. Cost of the vessels, steam-boiler, leaden vitriol pans, manual labor, and fuel.

2nd. Inconvenience of dabbling in sulphuric acid, or permitting workmen to do so.

3rd. Cost of reduction of the vitriol to a concentrated state.

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* The views of the author were supported by the several speakers who entered into a discussion of the subject, with the solitary exception of Mr. West, who seemed to prefer haggling about terms rather than confining his attention to the chemical fact that the only combustible portion of smoke is the *carbon*, which is suspended in so much incombustible matter, that, as far as economy is concerned, its combustion is most difficult, and can only be effected at the expense of fuel to burn it; whereas gas with a due admixture of air affords smokeless flame. Professor Apjohn, president of the chemical section, spoke in very high terms of Mr. Williams's treatise on *The Combustion of Coal*, in which, as it appeared to him, he had entirely exhausted the subject; he fully coincided in all that was advanced, and considered it best to *prevent* the formation of smoke.

In reply to an inquiry from the chairman, Mr. Dircks stated that the principle he advocated was that practically carried out by the Argand furnace, the invention of Mr. C. W. Williams.

4th. Loss of acid and disagreeable odor given off as the vitriol becomes dilute and acts upon the lead.

5th. The length of time required for the operation.

Against all these objections, the extract produced does not surpass that procured by exposing the juice on dishes in a room through which a current of air is impelled by a blower, such air having been heated by a charcoal brazier. I must be allowed to express my conviction that Mr. Hooper (I cannot believe unconsciously) has either resolved to monopolise "Vitriol Spontaneous Extracts," or that he is rather deeply indebted to Drs. Prout, Pereira, Hodgkin, and Julius Jeffreys, Esq., for a severe quizzing than for useful suggestions, and I am sure no more severe punishment could be inflicted upon these gentlemen and Mr. Hooper than to require from each of them the manufacture of one ton of extract by [*]the method to which their suggestions have contributed so much, even if four times the present market price were offered as a fee for the product. Taking Mr. Hooper's data, the following is an estimate of the cost of manufacturing 16¾lbs. of extract of henbane by this process:—

Mr. Hooper states that with a surface of 7200 inches superficial, one man working at the blower for 12 hours can evaporate six pints of liquid.

After vitriol has absorbed thrice its weight of moisture, it requires to be concentrated. Then—

	£	s.	d.
To concentrate 60lbs. of sulphuric acid	0	2	6
178½lbs. of juice = 140 pints require 23⅓ days, 1 man at 3s. 6d.	4	1	8
Fire, lighted 24 times	0	6	0
Firing for 24 days, to maintain steam heat, 1 ton of coals .	1	5	0
One pint of oil per diem to lamp = 8 gns., 3s. 6d. . . .	1	8	0
Use, wear, and tear, &c., of apparatus for 24 days, at 2s. 6d. per diem	3	0	0
	10	3	2
Three cwt. of henbane, at 20s. per cwt	3	0	0
16¾lbs of extract, at 15s. 9d. per lb.	£13	3	2

[*] Dr. Hooper's charge for ext. hyoscyaine is 1s. 4d. per oz. I cannot conceive how our friend can designate his arrangement as possessing advantages over the common method of spontaneous evaporation, with such an estimate of expenditure, neither can I understand how the terms "simple in construction and easily managed" apply; but the extent to which Mr. H. has pushed his method of manufacture, a fact known only to himself, would perhaps best solve this question.

Strictly speaking, the term spontaneous does not apply where heat is used, yet as explained in reference to the term *in vacuo*, we must accept terms as usually understood.

Figs. 5 and 6 represent a blower which I have attached by a band to the flywheel of a steam-engine; the fans of this revolve about 320 times in a minute, and send through a cast-iron pipe, heated to redness, laying under the boiler of the steam-engine, a powerful blast of heated air into a small chamber; this blast will support a pressure of two ounces to the inch at the end of the conducting tube, and extracts thus prepared are very excellent; I find the temperature of the chamber is maintained at about 100° F., although at first it rapidly rises to 140° F.

I have also adapted to the exit tube of the vacuum pumps a pipe passing through the furnace of the steam-boiler, and by opening the connection so that air may be drawn freely from the atmosphere have forced such air through the heated pipe into the upper part of Fig. 9 at A, allowing the partitions to dip in the liquid to be evaporated. Extracts thus prepared yield to none in point of flavor, medicinal efficacy, and strength.

The last method which I have adopted has been by filling a cast iron chamber whose height is seven feet four inches, width five feet, and depth two feet, with dishes piled on each other, and filled alternately with chloride of calcium and the liquid or liquids to be evaporated, then exhausting by means of the air pumps such chamber, until the barometrical indicator stands at 28 inches, the torricellian vacuum being 30 inches, then cutting off the communication with the pumps and allowing the vacuum chamber to remain undisturbed for four days, occasionally shutting off the suction pipe from the vacuum pan, and letting it on to the vacuum chamber for five, ten, or fifteen minutes, or longer if the men are engaged emptying the vacuum pan. This chamber and dishes are represented in figure 7.

In this process, which a friend terms "Leslie's arrangement, on a magnificent scale," the cost of fuel, except as regards working the engine, is reduced as low as possible, for it is simply required to calcine the moist muriate of lime in an iron pot, to reduce it to its original state. A vacuum as above described, is procured, if the chamber be quite full, in about 30 minutes.

My method for concentrated solutions of dried plants may be described as "*Infusion in vacuo.*" Figure 8, a vessel adapted to this purpose, and either evaporation in the vacuum pan by a current of heated air, or in the vacuum chamber by absorption, and every day's experience convinces me that each of these arrangements may supersede the other, according to varying circumstances as regards either the state of the plant, proneness of the proximate principles to decomposition, and, as far as the writer of this is concerned, keeping the various arrangments in constant work, so as to economise men's time steam power, fuel, &c.

To harmonise all these incongruous elements—amongst which, the disappointments occasioned by the herbalist, bad seasons, derangement of machinery, leakage of joints, judgment requisite to calculate the demand, competition, necessity of instructing the purchaser of their value, do not by any means fill up the sum total—requires the supervision, if of no higher talents, at least of active industry, and it will be found that the most indomitable perseverance and tact must be brought to bear to cause the various laborers to fulfil the intentions of the pharmaceutical chemist, himself the humble pioneer to the physician, apothecary, surgeon, and dispensing druggist.

At some future time I propose giving a sketch of the preparation of extracts, commencing from the Count de la Garaye's introduction of essential salts, as he termed them, and which eventually directed Pelletier to the discovery of quinine, and embracing details of the processes now presented to the reader, especially as regards economy of production and excellence of the product.

EXPLANATION OF PLATE.

Fig. 1. Section of evaporating pan of tinned copper.

Fig. 2. Section of water-bath.

- *a a* Copper pan containing water, or saline solution.
- *b b* Section of Wedgwood evaporating basin.

Fig. 3. Section of evaporating pan, heated by means of high-pressure steam, and where distillation is resorted to.

- *a a* Large cast-iron pan, rivetted at *b b* to the copper pan *c c*, on which the dome cover *d d* fits, being ground at the flanges *e e*. The liquid passes in the aëriform state at *f*, the object of the dome being to prevent condensation of the vapor and contact with the atmosphere.
- *g* is the supply pipe, and connected therewith is a safety-valve and force-pump, not figured in this section.

Fig. 4 is a sketch of the arrangement of vacuum pan, showing the size of air-pumps, and their connection with steam-engine condensing apparatus, &c.

- A Steam-engine.
- *a* Steam main, supplying engine, *b*.
- *c* Steam exit pipe, conveying the waste steam, after it has performed its work in the cylinder, to beneath the vacuum pan.
- *d* Steam chamber beneath vacuum pan.
- *e* Condensed water pipe.
- *f* Exit pipe for taking steam to other apparatus when pan is not used.
- *g* Flywheel of engine.
- *h* Rigger driving the blower, *i*.
- *k k* Vacuum pumps. These are double-action, the piston rod being enclosed in a stuffing box.
- *l l* Suction pipes of double-action vacuum pumps; the exit pipe, being on the opposite side, is not shown.
- *m* Suction pipe, leading from condenser to vacuum pumps.
- B Vacuum pan.
- *n* Evaporating main, leading to condenser, *o*.
- *o o* Condenser, consisting of a pair of pans formed of two hemispheres, each 2 feet diameter and 9 inches deep, united by a series of copper pipes, each 2 inches diameter and 6 feet in length; the whole immersed in a back of cold water, whose contents are about 600 gallons.
- *p* Injection pipe, admitting cold water from the back when aqueous solutions are being evaporated. This is closed when spirituous solutions are being operated upon.
- *q q* Hemispheres, each 3 feet diameter and 10 inches deep, forming vacuum pan
- *r r* Sight holes.
- *s* Funnel to admit liquid, during process.
- *t* Proof stick, for trying solution without interrupting the vacuum.
- *u* Barometer and manometer, both dipping into the same mercurial cistern, and thus affording accurate indications.
- *v* Thermometer.

w Upper man-hole.
x Lower ditto.
y Cold water force-pump, conveying water to boiler.

Fig. 5. Fans of blower.

Fig. 6. Section of blower.
a a a a a a Fans.
b b b b b Entrance of air.
c c c c c Passage and exit of air.

Fig. 7 is a cast-iron chamber, whose dimensions are 7 feet in height, 5 feet in width, and 2 feet in depth, connected with the suction pipe of the vacuum pumps.
a a a a a a a a Glazed lights, to admit of examining the liquids submitted to evaporation.
b b b b b b b b Rods on which the sliding pannels travel by means of the friction wheels.
c c Sliding pannels, ground so as to fit air-tight to the raised rim.

This chamber being filled with the liquid to be evaporated placed in dishes with alternate layers of chloride of calcium, the air is exhausted by the vacuum pumps, and evaporation proceeds at a very low temperature.

Fig. 8. Vessel for macerating *in vacuo.*
a Iron pan, tinned inside.
b b Cover thereto rivetted on.
c Man-hole, to introduce ingredients.
d Cover thereto.
e Silk valve, with thread cut, in order to attach an exhausting syringe.
f Cap to prevent access of air after exhaustion.

Fig. 9. Section of cover to be suspended over the flat-bottomed pan, Fig. 1, when evaporation by a current of hot air is resorted to.
A Pipe, communicating with blower, which drives heated air in the direction of the arrows.
b b b b b b Section of concentric circles of metal, dipping, according to the power of the hot blast, in the liquid to be evaporated, and contained in pan, Fig. 1.
c c Handles by which the pan is suspended in the required position.

Fig. 10 is a plan of the same vessel, in which the same letters are used to denote similar parts.

SOLUTION OF BALSAM OF COPAIBA.

BY LEWIS THOMPSON, M.R.C.S., ROYAL POLYTECHNIC INSTITUTION.

Having administered the following solution of copaiba in a great number of cases during the last seven years, I can confidently recommend it to the notice of the profession, merely observing that in recent cases where the patient is of a plethoric habit, and the inflammatory symptoms run high, it is necessary in the first instance to reduce the system by a course of sulphate of magnesia and potassio-tartrate of antimony; after which the solution may be given, and will generally effect a cure in from ten to fourteen days. When, on the contrary, the health of the patient has suffered, and there is reason to fear that a gleet is about to be established, the iodide of potassium may be combined with the solution, and will then be found almost specific in such cases. In conclusion, I may remark that I have never known any unpleasant symptom arise from the use of this remedy.

To prepare the solution, dissolve two ounces of carbonate (formerly subcarbonate) of potassa in one pint of water, and add to this, balsam of copaiba in a thin stream, constantly stirring the mixture, until this, at first white and milky, becomes clear like jelly or amber, which will generally take place when about a pint of balsam has been added; set the mixture aside for two or three hours, then pour in two pints of spirit of wine, and mix the whole together; the solution is then fit for use, and may be flavored with any of the essential oils. Sweet spirit of nitre may be substituted for spirit of wine: but it is necessary to destroy its acidity by distillation from lime or potassa, otherwise a decomposition will take place.

This solution is compatible with iodide of potassium and nitrate of potassa, but is decomposed by all earthy, metallic, and ammoniacal salts, such as sulphate of magnesia, chloride of iron, acetate of ammonia, &c., which must not, therefore, be administered in conjunction with it.

ON THE DETECTION OF ARSENIC IN MEDICO-LEGAL RESEARCHES BY REINSCH'S TEST.*

BY ROBERT CHRISTISON, M.D.

After briefly noticing the new method of detecting arsenic proposed by Professor Reinsch, than which, he states, nothing can be more simple, easy, and precise, the author informs us that his object in briefly calling the attention of professional men to the subject on the present occasion, is to mention the results of its application in two medico-legal cases in which he had employed it, and to point out one or two circumstances which ought to be kept in view in order to give it its full value, as the means of furnishing irrefragable evidence in criminal inquiries.

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* Abstracted from the *London and Edinburgh Monthly Journal of Medical Science*, September, 1843.

Reinsch's test is not to be regarded, strictly speaking, as a test of the existence of arsenic. No new test is required for determining the nature of arsenic when once it has been isolated for examination. Reinsch's process, however, is of far greater value than if it had merely presented chemical science with a new test for arsenic; it constitutes the simplest, easiest, and most secure mode of separating arsenic from the most complex states of mixture, in such a condition as to enable the experimentalist to apply the metal with greater facility than any of the characteristic tests already known.

In Dr. Christison's opinion no method of testing approaches the following in facility, delicacy, or conclusiveness:—Cut the copper, on which the arsenic is deposited, into small chips, so that they may easily be packed in the bottom of a small glass tube, and apply a low red heat. A white crystalline powder sublimes; and if this be examined in the sunshine, or with a candle, a magnifier of four or five powers will enable the observer to distinguish the equilateral triangles composing the facets of the octohedral crystals formed by arsenious acid when it sublimes. Sometimes the three equal angles, composing a corner of the octohedron, may be seen by turning the glass in various directions. If triangular facets cannot be distinguished, owing to the minuteness of the crystals, then shake out the copper chips, close up the open end of the tube with the finger, and heat the sublimed powder over a very minute spirit lamp flame, chasing it up and down the tube until crystals of an adequate size are formed. Next, boil a little distilled water in the tube over the part where the crystalline powder is collected; and when the solution is cold, divide it into three parts, to be tested with ammoniaco-nitrate of silver, ammoniaco-sulphate of copper, and sulphuretted hydrogen, in the state either of gas or aqueous solution.

Dr. Christison expresses surprise that in the multitudinous researches made on the subject of Marsh's process, by many chemists, in France, Germany, and Britain, no one has, to his knowledge, bethought him of applying, as a test of the nature of an arsenical crust, the conclusive process above described, and first suggested to the author in 1826, by the late Dr. Turner.

"In employing Reinsch's process with the system of tests superadded as now explained the following particulars have incidentally occurred to me as worthy of notice:—

"In boiling organic substances in the weak hydrochloric acid care must be taken to ascertain that there is a decided excess of acid always present. Two fluid drachms to every eight ounces of liquid are in general sufficient; but if the organic matter be an animal texture in the state of decay, a much larger quantity of acid may be necessary, owing to the presence of ammonia, which tends gradually to neutralise the acid as the solution goes on. Reinsch does not advise filtration of the acid, after the acid has acted sufficiently on the subject of analysis. But, notwithstanding the delay occasioned by filtration, this seems to me advisable in most instances, otherwise organic particles are apt to attach themselves to the copper, and thus to give rise to empyreuma when the metallic arsenic is driven off by heat.

"The most convenient form of using copper is that of the copper-leaf; but ordinary plates of copper may easily be made of any degree of fineness by immersing them for a time in diluted nitric acid.

"Where the quantity of arsenic in the fluid is supposed to be small, nearly half-an-hour should be allowed to elapse before the copper is removed.

"Before applying the sulphuretted hydrogen as a test to the solution of the sublimed oxide, the solution must be acidulated with hydrochloric or acetic acid."

In every case the whole process should, in the first instance, be applied to distilled water, acidulated with the hydrochloric acid to be afterwards employed; and if the copper be tarnished, a purer acid must be obtained, or the copper must be subjected to the subsequent steps of the process in order to ascertain whether or not the tarnishing be occasioned by arsenic.

Dr. C. employed the preceding method in two medico-legal cases. In one, where the body had been buried for four months, and where the arsenic had been detected in the contents of the stomach by Marsh's method, and in a portion of the liver in the same way, preceded by Orfila's process for the destruction of animal matter, he very easily succeeded in obtaining, from about one sixth part of the stomach, after it had been thoroughly washed, repeated steel-colored crusts upon copper, which, when heated in a tube, gave out white crystals with triangular facets; and the solution of these crystals gave characteristic indications with ammoniacal nitrate of silver, ammoniacal sulphate of copper, and aqueous sulphuretted hydrogen. In the second case, also four months after interment, the contents of the stomach, boiled with hydrochloric acid and filtered, were not visibly altered by a stream of sulphuretted acid gas, which was applied to a drachm of the liquid. Nevertheless, Reinsch's process yielded the same results as in the former case. A portion of the liver amounting to one sixth of the whole organ, which had been sent from the country along with other materials for analysis, was then subjected to the same process. Arsenic was also indicated, but in very minute quantity. Dr. Christison was satisfied with the application of one liquid reagent to the solution of the sublimate, namely, the ammoniacal nitrate of silver, but there was sufficient solution for all three. By the same method as that applied to the liver, he obtained arsenic in larger quantity from one half of the stomach.

In conclusion, Dr. C. states, that the experience he has had of this method of analysis in medico-legal researches, brief though it be, is yet sufficient to convince him that it must soon supersede the beautiful but much more elaborate method of Mr. Marsh. It may be applied even to the tissue of the stomach, and, including the process of filtration, in the short space of two hours.

[In the following article we have Professor Orfila's opinion on the merits of this process.]

POISONING BY ARSENIOUS ACID.*

REINSCH'S PROCESS.

This process consists in acidulating the arsenical liquid with hydrochloric acid, and in boiling it with metallic copper, which is very soon covered with a greyish layer of arsenic. According to Reinsch's statement, a very small portion of arsenic is detected by his process. Alimentary and vomited substances may be treated in an analogous manner for the purpose of demonstrating the presence of that poison. These substances are to be treated with pure hydrochloric acid, diluted with its weight of water; the liquid is to be filtered and treated with slips of copper. To prove that the copper slips contain arsenic, M. Reinsch introduces them into a tube drawn out into a point at one of its ends, a tube of a smaller diameter being adapted to the other end. The tube being heated, by means of a spirit lamp, on the place where the copper slips are deposited, the arsenious acid formed by the combination of the oxygen of the air sublimes and condenses under the shape of small brilliant and easily recognised crystals. When Reinsch wishes to obtain metallic arsenic, he puts the slips of copper, covered with arsenic, into a glass tube drawn out at one end, through which he passes a current of pure and dry hydrogen, at the same time heating the slips of copper; the hydrogen combines with the arsenic and forms arseniuretted hydrogen. This hydrogen is inflamed in order to obtain arsenical stains, in the same manner as with Marsh's apparatus. *(Echo du Monde savant*, 12 *Fevr.* 1843.)

I wished to ascertain the advantages and the inconveniences of this process.

Experiment I.—I boiled during half an hour 7 grammes of copper slips with 291 grammes of fat broth, containing some drops of an aqueous solution of arsenious acid previously acidulated with hydrochloric acid. The slips, covered with a brownish layer after the operation, were heated in a glass tube, according to Reinsch's directions, and I obtained in one part of the tube a white ring, and in the other a ring colored green and brown by chloride of copper and organic matter; the first of these rings presented *all the characters of arsenious acid*, whereas the second, treated with the agents proper for detecting that acid, did not exhibit the reactions peculiar to it.

Experiment II.—I boiled half the liver of a dog poisoned by 6 decigrammes of arsenious acid with slips of copper in water which was well acidulated with hydrochloric acid; the slips became brown, at the same time retaining their brightness. Some of them, on being heated in a glass tube, gave a ring of arsenious acid; and some, having been put into a Marsh's apparatus, scarcely furnished any arsenical stains.

New slips of copper were placed in the liquid at 5 o'clock in the evening, and remained therein the whole night; next day they were brown and tarnished. Heated in a glass tube, after having been washed, they gave a ring which probably contained arsenious acid, but certainly containing chloride of copper and organic matter; consequently when this ring was treated by nitric acid, and the solution evaporated to dryness, the result was a product which proved *no* arsenical reactions.

Some of the slips having been heated in a current of dry hydrogen gave with difficulty three or four stains whose aspect *was not arsenical*, and which were evidently formed by organic matter; by the reagents proper for indicating arsenic it was impossible for me to prove the presence of that substance.

Other slips having been placed in the liquid, which had already been twice acted upon by copper, acted precisely in the same way as those which were placed in it a second time;

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* *Traité de Toxicologie, par M. Orfila Vol. I. Supplement, page* 705.

in the Marsh's apparatus they produced not one stain.

The solid portion of the liver, which had not been dissolved in the hydrochloric acid, *retained much arsenic*, for, when incinerated with nitrate of potassa, after having been previously well washed, it yielded a considerable quantity of that metal.

Experiment III.—I treated several of the slips which had remained in the liquid with nitric acid, for the purpose of transforming the arsenic which they might have contained into insoluble arseniate of copper; I evaporated the liquid to dryness, in order to expel the excess of nitric acid, and I then dissolved the nitrate of copper in water. The precipitated arseniate of copper, after having been washed, was introduced into a Marsh's apparatus. The results which I obtained were so different from one another that it was impossible to come to any decisive conclusion: in some cases I obtained a pretty considerable number of arsenical stains, in others I had less; finally, in others, I had none at all. However, when I decomposed the arseniate by potassa, before I introduced it into the apparatus, I constantly obtained arsenic.

I think I may conclude from the foregoing, that the process proposed by Reinsch is not nearly so valuable as its author would make out; *first*, because it is difficult, if not impossible, to dissolve in hydrochloric acid the whole of the arsenious acid contained in the organs into which it has been carried by absorption (Experiment II.); *secondly*, because, even granting that by employing *a great number of copper slips* the whole of the arsenious acid had been extracted from the dissolution of hydrochloric acid mixed with organic matter, it would not be possible to extract by means of heat, nearly all the arsenious acid, and which besides would perhaps not present all its characters (see Exper. I.); and finally, because it is not true that the hydrogen easily transforms the arsenic contained in the copper slips into arseniuretted hydrogen.

However, I see no inconvenience, and it may perhaps turn out to be advantageous to test *a small quantity* of the suspected arsenical liquid by Reinsch's process; indeed, if after having boiled two or three slips of copper and a few grammes of the liquid with hydrochloric acid during a few minutes, after a certain time they lose their color, and seem to turn white, we may believe that they have taken arsenic from the liquid, and it will be sufficient to subject them to the heat of a lamp in a tube containing air, to obtain arsenious acid.

Guided by this result the experimenter can afterwards extract the arsenic by treating the whole suspected mass with chlorine (v. p. 709). It is indispensable, however, before making use of the copper, to ascertain that it does not of itself yield arsenic. The brown color of the slips cannot be considered as an indication of the presence of arsenic, for they acquire that color when put into a liquid which contains a little non-arsenical hydrochloric acid, especially when this contains organic matters.

[We are indebted to Dr. M. Rosenthal for having communicated to us the preceding valuable article.—EDS. CHEMIST.]

THE TOTAL INCOMPETENCY OF THE HEALTH COMMISSION IN LIVERPOOL.

IN the July number of this journal the utter unfitness of the parties appointed to the office of commissioners to inquire into the state of towns with reference to the state of health and the causes of disease was clearly and minutely detailed; now, however, from *actual personal knowledge* of the course pursued in Liverpool and Manchester, the correctness of the observations then made is but too plainly proved, nay, even to such an extent as to cause nothing but laughter when the subject is introduced before those whose scientific attainments and great local acquaintance in each place give them the best of all opportunities of becoming perfectly conversant with the sources of disease and the best means of devising remedial measures.

That, "as a tree is known by its fruit," "so is a man by his works," is an axiom of the highest authority and of the most evident truth, and in the course of our long scientific career never did we witness so conspicuous an exemplification of its force as in the proceedings of Dr. Lyon Playfair during the prosecution of his inquiries—we might indeed say "playing the part," of one of her Majesty's commissioners, so *wisely* and so *well chosen* as is the junto to which this most important investigation has been confided—"*wisely* and *well chosen*" we repeat in derision, because if there is one office which, more than another, demanded the greatest care in the selection of persons of profound medical acquirements and of ample experience, it is that very one which has been entrusted to a mere youth having not the least claim to distinction in either chemical or medical science.

It is with perfect freedom from all motives of interest or personal feelings that we make these remarks: it has ever been our endeavor, as independent journalists, to detect and expose jobbing, to reduce the assuming upstart and pretender to his proper place, to set the public right as to the real merits of such a person, in order to guard it against the evils and dangers of undue confidence being placed in him, and against the imposition which is the result whenever characters of this description are thrust into offices for which they are wholly unfit.

In the subsequent part of these observations we shall enlighten the minds of our readers concerning the manner in which this Dr. (we might say *Master*) Lyon Playfair was chosen one of the commissioners, and appointed to the town of Liverpool, to the exclusion of such men as Dr. Duncan, Dr. Brandreth, Dr. P. J. Murphy, Dr. O'Donnel, Mr. Bickersteth, &c., &c. (resident in Liverpool), and Dr. Holme, Dr. Bardsley, Mr. Jordan, Mr. Davies, Mr. Turner, &c., &c. (in Manchester), the birth-place of a Dalton and a Henry.

Need we remind our readers of the power and opportunities possessed by these gentlemen of making disclosures and suggesting remedies, which one so inexperienced as the doctor is totally unqualified for, and incapable of observing or supplying.

To prove the truth of this remark, let us briefly review the results of his visit and investigations; and we shall find verified, to the tittle, the saying—"If you send a fool to France, he will come one back;" and in this very unenviable situation do we find the *fortunate* commissioner,* who has returned from Liverpool without taking the least notice of some of the most loathsome and dangerous nuisances, and without that profound and extended consideration of all the circumstances which from more capacious and experienced minds would have been the very first to have claimed attention and report.

In Liverpool are many sinks of corruption and filth, in the highest degree disgusting to the senses, and obnoxious to the health of the inhabitants.

In the number of this journal to which we have already referred, we stated our opinion of the danger and nuisance of those outlets of the sewers which some of our wise innovators have caused to be made, and our conviction, but for our notice of them, that they would be totally neglected by the commissioners. It is now our duty to notice the utter inattention to the drainage and mode of carrying away the soil and refuse of this town of Liverpool.

While there, the doctor became a peripatetic of all alleys, courts, cellars, and garrets, inquisitorially breaking in upon the privacy and feelings of the humble and depressed poor; we are certain that his visits have done no good, if they have effected no harm; but from accounts we have since received, we are satisfied that the latter is much more likely to be the result, both to the poor and to the rate-payers, as we shall shortly proceed to point out and to detail.

Concerning the question of dwelling in cellars, there are two very important and very opposite considerations; the first regards the healthiness of the situation as to drainage, ventilation, dryness, and cleanliness; the second regards the state into which the occupants will be thrown by their removal from these places into more elevated ones, and when these two considerations are duly weighed, it will be admitted, with us, that, bad as their present state undoubtly is, greater evils will result from their total and hurried suppression than now exist through their continuance, as the following statement will amply exhibit. It is perfectly well known to every one visiting Liverpool that these cellars or ground floors are formed into little shops, inhabited by vendors of all kinds of provisions, chandlery, &c., &c., and afford them the means of obtaining very considerable profit, whereby they are enabled to earn a very good livelihood, or, with the aid of some occupation followed by the male portion of the inmates to increase their scanty incomes, and, consequently, their comforts. What, we ask, will be the result of so suddenly depriving these poor families of this means of support, and of compelling them to remove to higher situations? We reply that the means of support for hundreds will be cut off, and they must either go to the unions—a nice alternative—and thereby burden the rate-payers, or sink into abject poverty, and engender far greater numbers and worse kinds of diseases than resulted from their existence in cellars or kitchens; for we contend that with plenty of good and wholesome food, procured by their little trades in these places, health will be much better preserved than in more elevated situations under poverty, distress and want; such is our firm conviction, founded on long experience; and, unless other counterbalancing conditions be attended under the change, we doubt not that, in a short time, the truth of the remark will be made but too evident, especially at the season of the year now approaching. Certain, however, it is that a well-paid commissioner *must do*, or *affect* to *do something*, be it what it may; but we are so far inclined to despair of any good resulting, as to be sadly apprehensive of harm, and to consider it our duty to lay the whole subject, as far as we have been enabled to collect information, before our readers and the public, both of whom are so deeply interested in an inquiry so important, and surrounded with so many subtle and difficult considerations.

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* What are his metropolitan colleagues about? we hear nothing of them.

Our objections to Dr. Lyon Playfair, however, are by no means confined to the subject of the previous statements, but extend also to his utter neglect (through inexperience) of the most important evils and disgusting and dangerous sources of malaria, and to his want of an adequate knowledge and extensive views, the possession of which alone could fit him for the high officc of investigating the healthy state of so populous and considerable a place as Liverpool, wherein the drainage is peculiar, and whose situation by the side of so large a river as the Mersey, yielding a vast source of evaporation and condensation, require, for the full contemplation of their effects on health, a mind of a much wider calibre than is possessed by any youth of his age, wherever educated or by whomsoever patronised.

Of the peculiar method of drainage we shall first briefly take notice. The water-closets and privies of this town are not allowed to evacuate their contents into the drains or sewers which open into the Mersey, but are emptied and cleansed. It is true we hear of him visiting soap-makers and giving them great trouble. Now, in our opinion, soap-makers deal more in disinfecting than in injurious matters, and greatly tend to cleanse streets and sewers. When he visited Naylor-street, did he notice the horse-slaughterers' yard, where pigs are breeding by the scores on the refuse? The former are made to pour their contents into a receptacle at the back of the premises, where a kind of tank is built of bricks, and from which, through a kind of trap door, a man—there called "a muck-man," in London "a night-man"—comes, in the night-time and removes the contents, and the nuisance caused by this work subsequently is such as to prove unbearably disgusting often for days; even while writing this our olfactory nerves are assailed by odor, stirred up by one of these filthy but necessary operators. It will easily be conceived that in these reservoirs all kinds of vegetable and animal matter, in all stages of decomposition, highly obnoxious to health from the production of infectious malaria are continually being deposited, and yield most dangerous exhalations. In houses of the more humble kind, the privies are placed also at the back part, and are emptied in a manner precisely similar; but as their number is so much greater than that of water-closets, they prove a source of the most serious nuisance and danger to the inhabitants.

Great and evident as are these abominations, yet will our readers scarcely feel inclined to believe the fact stated to us by the highest authority, that the doctor has entirely overlooked them as objectionable, and we do not know that he has taken any notice even of their existence, although he ought to know that vegetable and animal matter, macerating for any length of time in a given quantity of stagnant water, affords a most pregnant source of disease. Our researches, made some years' back, with much care and attention, and with great risk and exposure, have enabled us to determine that it becomes the most infectious and deleterious of all kinds of effluvia.

We may now inquire, are there *no* other causes of disease in this important town? Does its character for unhealthiness, as given by Dr. Duncan (who deserves well of its inhabitants for his investigations and observations), rest totally on drainage, the dwelling in cellars, or the want of ventilation in certain places? Is not the locality, and especially its close proximity to a large river, to be taken into account? We can state, from ample experience of similar situations in London,* that, where evaporation and condensation are perpetually and extensively going on, and where with them are carried up at one time, and at another, deposited exhalations of various kinds, such as those in marshy places, a much more powerful generation of disease is to be found than in all other kinds of causes, and in states by far more effective in the engendering of febrile and inflammatory affections.†

What notice the doctor has taken of the peculiarities of Liverpool in these respects, time has yet to develope, and, among many others, we are looking forward to the publication of his report with pleasure and anticipation.

So much for his visit to, and inquiry into, the state of Liverpool. We now come to a subject which will afford our readers, as it has done us, much mirth and amusement, and will show how very convenient it is—no matter how—to pick up a reputation.

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* The mode of drainage and carrying off the filth in both places, indeed, in all large towns, requires a total change, and on a principle quite different.

† In the autumn of the year 1825, an epidemic prevailed in London, which was marked by this peculiar circumstance; that the fever raged, and especially in elderly persons, proved fatal to many residing on that side of the street nearest to the Thames, while those on the opposite side were scarcely, if at all, affected. It was nearly confined to that side of the Strand, Fleet-street, St. Paul's Churchyard, and Cheapside, nearest to the river.

The summer had been very hot and dry, but towards the end of August, the nights became cool, and produced much condensation.

A certain plate-glass company, a few miles from Liverpool, took it into their heads to write to the doctor, to know if they might commence working, as they had just completed the fitting up and arrangement of the establishment: the doctor wrote in reply, "that they might." Now, lest it should enter the readers mind that the question related to some matter connected with his office as commissioner, it is necessary to assure him that it had no such object, but had reference wholly to the *prospect* of the *speculation.*

Is it possible that men of business could have stultified themselves by an application such as this? Why did they not, at the same time, ask the opinions of the Archbishop of Canterbury, and the Chief Rabbi of the Jews, persons equally competent to judge?

So much for the learned doctor's visit to Liverpool, and now for that to Manchester, where we find him first of all among the *literati* at the Athenæum, and called on by Mr. Charles Dickens to propose a sentiment. There we will leave him for the present, and proceed to the health commission in this town, which exhibits many features very peculiar to itself, and different from those presented to him in the former place. The sewers here are allowed to receive the contents of the water-closets, privies, and slaughter-houses, and, therefore, although it certainly may be termed dirty in general as a town, yet, from the circumstance of this communication with the water-courses, is its drainage better provided for and conducted, and as the Irwell is a river not used as a source of supply of water for domestic purposes, the refuse is allowed freely to pass into it, and be carried off by its current. What discoveries have been made by the doctor we cannot yet learn; of course he has found cellars inhabited, as in Liverpool, and also dirty alleys and courts, which, we suppose, he will cause to be routed out. He has visited, among other bodies, the Odd Fellows' Society, and, as might be expected, he has found them as odd by nature as by designation, for they declined to have their privacy too much broken in upon and infringed, conceiving his questions irrelevant, unnecessary, and useless.

We cannot help noticing the fact, that the authorities of Manchester seem to be as much infatuated with the doctor's pretensions as our friends the glass company, for they did not seek instruction from him, but opened to him their whole *arcana* of science, and all the Pandoras in the town, and, last of all, being determined not to be outdone by the authorities in *well-merited courtesy,* the Royal Institution have made arrangements to fit him up a laboratory, and place him in the situation of lecturer to it, thus at once making him a resident of the town. The directors of this establishment are greater admirers of lectures and lecturers than are we, who would not expend two shillings to become perpetual attendants on all the doctor's courses, and our opinion of them as a mode of instruction, is confirmed by Dr. Johnson, who observes, "you *may* teach chemistry and shoe-making by lectures," and often have we been present at a very cobbling exhibition in those on the former subject.

These gentlemen have surely been taken by surprise, from respect for the quarter whence the doctor has obtained his promotion, and cannot have given the subject of ofhis real merits due consideration; we should be very sorry to advance anything reflecting on the directors of the Manchester Royal Institution, but we cannot but remark that if he goes on foisting his pretension upon the public with the same speed with which he has succeeded with the plate-glass company, and with them he will, in a very short time, *paternize* a larger ready-made family of fools than even Mr. Jacob Bell, the luminary of the Pharmaceutical Society of Great Britain.

Her Majesty's commissioner will find the employ of the laboratory, and delivering lectures to a mixed audience, especially if honoured by the attendance of the "Lancashire Witches," a much more pleasant office than torturing the delicate filaments of his olfactory nerves with the effluvia of slaughter-houses and water-closets. He has given proof of his good taste in avoiding these receptacles of filth, for, doubtless, he much prefers the odors of the viands previous to their entrance into, than after their exit from, the *primæ viæ.*

From the preceding statement it will naturally occur to the mind of the reader to require information as to the way in which such a person obtained from the Government the appointment of a commisioner; on this head also we are able to let into his understanding a little light of a very curious having, we should imagine, already and fully satisfied every one, that, *Lyon* though the doctor may be, he will never become a *star* in the hemisphere of science.

We can trace him from Giessen, where he was for some time at the University with Professor Liebig, and where he cut no figure, and after quitting was not even remembered. He is indebted for his very premature advancement in lucrative appointments to what *Sir Pertinax Macsycophant* would call "hooing," but what we, in plain English, term sheer assurance and forcing impudence. By some means or other, he induced Professor Liebig to confide to him the translation of his work on Agricultural Chemistry, which was manufactured in the following manner:—Deficient in a knowledge of the German language, he got Dr. Hoffmann to put it into English, and some one in London to revise it, and a most unique medley of the greatest work that ever appeared on the subjects of its contents has thus been made by this tricompound of translators, for, in the whole course of our long experience, never, as relates to a knowledge of the respective languages, of the commonest rules of composition, of construction of sentences, and of the mere business of translating, did anything bad come under our notice as that which appears in the English edition of a work of one of the first chemists of any country. With but one or two exceptions, the word "the" commences each paragraph of the first two pages of the work; if anything worse can be found we have yet to learn, though certainly we have no wish for such knowledge. Future editions will, we trust, be confided to skilful hands. We by no means think highly of either translations, but that of which we have spoken stands in most unenviable preeminence.

After the service above mentioned, if such it can be called, and during the visit of Liebig to this country, Dr. Playfair accompanied him in his introduction to various eminent characters, and amongst them to the premier, Sir R. Peel, who very naturally formed an opinion that some peculiar gifts and merits distinguished the doctor, who acted the part of interpreter to the professor, and from this circumstance and his ancestral name, he has obtained that with which hundreds of his seniors and superiors have not been favoured (promotion and lucrative office), and no doubt, now understands, as can also the scientific world, how the question "What's in a name?" is to be solved. His sudden rise is an apt illustration of the observation, that "the race is not to the swift, nor the battle to the strong," for, equally unknown to science and the world, he has been made a component part of most of the jobs recently concocted, and it is much better suited to his vanity and cupidity than to his abilities or acquirements. Had his emulation gone no further than to lead him to aspire to a situation such as that of chemical factotum at Gallipot Hall, we should have offered no objection, as such a piece of chemical preferment would have been much more in character than with such a man as Professor Penny, who very properly consulted his own dignity, and the respect due to his order, and indignantly threw it up and its shopman's stipend as unworthy of his notice. In our own opinion, even the erudite and modest chemist to the Customs would have been a much more proper choice and much more fit for the office. Would not one of our professors have done, we may inquire?

Enough has now been said to satisfy the public of the manner in which such appointments are formed, and of the kind and degree of the qualities and abilities of those who are selected to fill them, and with the exposure of the system and the different agents in it, our duty to the public is accomplished; we therefore leave the subject to his own reflections, and the inferences to which they will give rise, assuring him, that we have "nothing extenuated, nor aught set down in malice."

JACOB "AGAIN!"

"The examinations will tend to raise the qualifications of our members, and thus confer upon our body a degree of professional character. This credit will extend itself to all the members, and in course of time!!" *&c., &c.* – *Pharmaceutical Journal*, p. 148.

"The granting of a petition (by Parliament) to restrain grocers and other unqualified persons from encroaching on our department, would involve the necessity of at once establishing a distinction between the parties to be protected, and the invaders of their prerogative, which distinction could only be *founded on individual qualification* as tested by a *regular examination*."—*Jacob Bell in the Pharmaceutical Transactions for October*, 1843, p. 149.

Goldsmith quaintly observed, that it is very painful to witness an individual gaping with his mouth wide open when he had nothing whereof to deliver himself which might not be communicated in a whisper; this remark was never more applicable than to the lamentable exhibition of Jacob, one of the faithful, whose attempt to fashion inconsistencies the most egregious into "a leader," the above extracts will serve to expose, furnishing an apt illustration of the poet's satire.

After delivering himself of sundry buzzing bluebottle claptraps, quite as applicable to Bell's Antibilious Pills as to The School of Pharmacy, with which they are attempted to be linked in gaping characters, and type awfully impressive and emphatic, far from akin to the sober demeanour of Jacob's friends, the reader turns from the notable article from which I have quoted the heading of my letter, impressed with these conclusions:—

That the October "leader" may be likened to the bill of directions enveloping a box of antibilious pills, and is intended to be descriptive of the *virtues* of certain lectures about to be delivered by the once frail would-be Member for Marylebone.

Jacob's intellectual resources are exhausted, and, therefore, the readers of the *Pharmaceutical Journal* must put up with a *refaciemento* of previous articles, disguised in certain awkwardly constructed phrases; whilst, to remove every doubt in the mind of foolish, imaginative members, who think the manufacture of antibilious pills is not the ladder by which they may ascend to their proper place in the profession, Jacob insists—

"That self-constituted and dearly purchased membership is of no avail," to quote his words, the credit of those who *can* pass an examination will extend itself to all the members (who cannot!) and, in course of time, the diplomas of the society (when the present possessors are dead, and perhaps decomposed) will constitute a badge of distinction, entitling the possessor to public confidence.

And now we will put Jacob's algebra to the test. Given, its annual cost and possible value *in futuro via implicatione*, what is the present worth of a diploma from the Pharmaceutical Society?

And is this the *ignis fatuus* we have been pursuing? Are we to be indebted to a few lads who may happen to pass a puerile examination, for all the credit and value that is to attach to the possession of a diploma? We appeal to Mr. William Herring, and Mr. Luckombe, both men of intelligence and spirit; to the former, because we have seen his diploma ostentatiously paraded in a frame on Holborn-hill, to the latter, because he has paid twenty guineas to become a life member, and by these acts I believe both these gentlemen to earnestly seek the benefit of their class; I appeal to them therefore to exert themselves ere the ribald jeer of those with whom they come into collision in everyday life shall have stung their best feelings to the quick to suppress these foul calumnies, introduced under the spurious title of "Competition in the Drug Trade," a title as inapplicable as the credited badge of distinction would be dishonorable.

Let us have a Journal whose *collaborateurs* shall include Graham, Gregory, Clarke, T. Thomson, Pereira, Christison, A. T. Thomson, and others, free from the rancour of a Phillips, the twaddle of a Bell, the ungentlemanly pamphleteering of a Ure, or the notoriety-scribbling of any one; give the members a half-crown journal every month for the two guineas every year; the balance will be ample for the legitimate purposes of he society, even if insufficient to permit of private jobbing, and, by the fourth estate alone, the press, controlled by a paid editor of talent, let us hope to improve the condition of druggists through the length and breadth of the United Kingdom.

One who can dispense with,
aye, and without, a diploma.

PRACTICAL CONSIDERATIONS CONCERNING EMPLASTRUM DIAPALMÆ.

BY M. DAVALLON.*

The composition of emplastrum diapalmæ, has undergone, since it has been employed, only very slight modifications. Its constituent principles are always lard, olive oil, litharge, and a more or less considerable quantity of water; water which is intended not only to serve as a water-bath, and to prevent the temperature from rising above 212° F., but also to favor the reaction of the protoxide of lead on the fatty bodies, for experience demonstrates that without this intermedium no re-action would take place.

Most of the former pharmaceutical works do not point out the precise quantity of water to be employed; but almost all are agreed concerning the advantage of eliminating, so far as possible, by evaporation, that which would remain mixed with the plaster without being combined with it. Lémery, among others, expresses himself decidedly on this subject; he says that water must not remain in it, for it would prevent the plaster from being well bound, and, consequently, from being well spread on the cloth. He even advises, after the consumption of the humidity, that the plaster be held over a low fire for half an hour, always stirring well, in order to dry it sufficiently, and to render it more plastic.

I had never thought of this observation of M. Lémery, when an accident showed me how just it was. Some simple plaster was being prepared in my laboratory; in a few minutes it was properly boiled, but water was wanting, the temperature rose, and some decomposed portions communicated to the mass a brown color, too slight, however, to render the plaster useless. I very soon ascertained that this plaster, spread on cloth. possessed (setting whiteness apart) all the qualities to be desired in sparadrap: suppleness, brilliancy, and, moreover, the advantage of being susceptible of longer preservation without contracting that strong odor which diapalmæ almost always has after a short time.

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* *Encyclographie Médicale, and Journal de Pharmacie*, September, 1843.

From that time I gradually diminished the quantity of water ordered by the pharmacopœia, and, after some experiments, I adopted the following formula:—

℞	Lard, olive oil	5·000
	Litharge	5·000
	Water	1·800

This quantity of water, added at the commencement, is sufficient; the operation, performed over a fire sufficiently bright that the boiling may not be interrupted, lasts from two hours to two hours and a half. Its different phases are nearly the same as when twice or three times as much water are employed; it appears to us, however, that the swelling is less considerable. In all cases, and with a little skill, it is easy to perceive when it would be prudent to add a few drops of water in order to finish the boiling of the plaster. The water is not entirely evaporated when the diapalmæ suffuses, and dry vapors of a fuliginous nature begin to be disengaged.

An important circumstance for the success of the operation is that the olive oil be pure; the addition of white oil, so common in commerce, causes it to give only a very imperfect product.

Some pharmacologists recommend pouring cold water on the plaster when properly boiled and while warm, in order to cool it, and facilitate malaxation. M. Davallon repudiates this practice, first, because the water added dissolves and carries away the glycerine formed by the action of oxide of lead on oils and fats, which cannot injure the good confection of the diapalmæ; and, further, because this malaxation which water is destined to facilitate, and the object of which is to render the plaster more supple and more plastic, is useless if the plaster be prepared as M. Davallon proposes; and, finally, because this malaxation has due effect, in some measure, of dividing in the plastic mass, atmospheric air and water, whose presence may cause rancidity of the plaster, and deficiency of malleability.

There is, therefore, according to M. Davallon, a real advantage in not washing it. It must be run, while warm, into wooden vessels, in which it is slowly cooled, and the pieces of litharge which may have escaped combination must be precipitated, and the excess of water must be brought to the surface.[*]

Thus prepared, emplastrum diapalmæ may be spread on cloth, without any other addition than a little olive oil, when sudden change from warm to cold weather render it necessary. In this case, the addition should be made before and not after the liquefaction of the plaster. Heated together, the union is more intimate.

Finally, M. Davallon regards the employment of course, which some pharmaciens add, as if not injurious, at least useless; for it little matters whether the sparadrap be a little less brilliant, provided that it fulfils the conditions which its employment requires.

ON THE ADULTERATION OF IODINE AND OIL OF SWEET ALMONDS.[*]

BY M. LEROY.

The adulterations in the drug trade have never been so numerous as at present; it seems as if the dealers had entered into a combination no longer to supply any but adulterated medicines. To put an end to such a state of things, all druggists should engage, every time they meet with adulterated medicines, to give publicity to the circumstance.

A sample of iodine has been sent to me by a druggist at Brussels, which was sold to him at 8 francs the half kilog.

This iodine was not presented in fine dry crystalline plates, of a lead grey color, like that obtained by a well conducted sublimation; but it was in a mass impregnated with humidity amounting to about 25 per cent., it possessed, moreover, a strong odor of chlorine: these characters led me to believe that it was obtained from another liquor by precipitation, by means of a current of chlorine; in this state, it would retain a large quantity of water. It also contained foreign matters, such as sand, &c.

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[*] We think there would be some inconvenience in separating the combination of the lead soap, the basis of emplastrum diapalmæ, in the midst of a large quantity of water. It is indeed very difficult to get rid of the whole of the liquid by malaxating the mass, an operation of which we cannot perceive the inconvenience, if the litharge be pure, and the proportions good. This excess of water interposed may contribute to the ultimate alteration of the compound; however, it is to be feared, if we employed only just the quantity of water necessary in one case, and which may not be sufficient in another, notwithstanding the precautions of the manipulator, that the mass would be colored, and it would be, in our opinion, a real inconvenience thus to lose the merit of whiteness, which seems to be a guarantee of the purity of the ingredients employed. Moreover, is not the rancid order of the metallic soap, especially owing to the reaction of the oxide of lead on the fatty body, and is it not a consequence of its acidification? P. F. G. Boulay.

[*] *Journal de Chimie Médicale*, Aug., 1843.

It has long been perceived among us that chlorides exist in the iodide of potassium of commerce, which is probably owing to the employment of iodine of the same quality as as that which I have just noticed.

A few days ago, having suddenly occasion for a certain quantity of oil of sweet almonds, I sent for some, stating that I did not regard price. As it was a person whom I knew, I had no mistrust. What was my astonishment on receiving this oil to find it adulterated with more than half its bulk of poppy oil! Its white color, and especially its great fluidity, compared with that of good oil of sweet almonds, as well as its odor and taste, although weak, left no doubt concerning this adulteration.

Authors generally state that poppy oil has no peculiar taste or smell: this is an error; this oil has an odor and a taste which are proper to it, and which those in the trade recognise with the greatest facility.

When I have time, I will examine the characters of these two oils, and the differences which they present in the state of mixture.

P.S.—There is an article to which I will call attention, namely, gum senegal. This gum is often presented under the most beautiful appearances; very particular care is required in selecting it, if it be desired to avoid receiving almost insoluble gums.

ANTIDOTES FOR CORROSIVE SUBLIMATE, COPPER, LEAD, AND ARSENIOUS ACID.*

BY MM. BOUCHARDAT AND SANDRAS.

Recent experiments on poisoning by corrosive sublimate, lead, copper and arsenic, have led MM. Bouchardat and Sandras to regard the following matters as counter-poisons:—

1. For corrosive sublimate: the mixture of powdered zinc and iron, iron reduced by hydrogen, and humid hydrated persulphuret of peroxide of iron.

2. For copper: the mixture of powdered zinc and iron, iron reduced by hydrogen, porphyrised iron, zinc filings, and humid hydrated persulphuret of peroxide of iron.

3. For lead: humid hydrated persulphuret of peroxide of iron.

4. For arsenious acid: humid hydrated peroxide of iron, dry hydrated peroxide of iron, and humid hydrated persulphuret of peroxide of iron.

5. This last preparation has this advantage, that, changing the nature of the four poisons which we have just mentioned, it is especially suited for cases in which the suspected substance may belong to one or other of these series, without it being possible, *à priori*, to decide to which.

A NEW PROCESS FOR THE ABSOLUTE DISTINCTION AND SEPARATION OF ARSENIC FROM ANTIMONY.*

BY W. BEHRENS.

So many methods have lately been found for the distinction and separation of arsenic from antimony in medico-legal investigations, and in particular Pettenhofer's method, corrected by Fresenius, so well answers the objects of the judges in the investigations concerning poisoning, that we are led to regard this subject as having arrived at the highest degree of perfection.

Nevertheless, we have not hitherto been acquainted with an efficient and practicable process for the quantitative analysis of these two bodies, when it is necessary to separate them in very small quantities. I have for some time separated them quantitatively, for example, in analysis of scoriæ, by a simple and sure method, which I will describe.

I convert the arsenic and antimony into sulphurets, and I add to the mixture, whilst still moist, an equal volume of neutral nitrate of lead, and nearly as much water. I boil the mass in a porcelain capsule, stirring, without interruption, and renewing the evaporated water, until the whole has acquired a deep brown color. I then filter it.

The residue contains all the antimony and a portion of the arsenic, the treatment of which will be indicated further on. The solution, which contains only arsenious acid, nitric acid, and oxide of lead, is treated with carbonate of ammonia so long as any precipitate is formed. I add hydrochloric acid to the liquor which is separated from the carbonate of lead by filtration, until there is an acid reaction, and I pass into it a current of sulphuretted hydrogen.

The sulphuret of arsenic obtained is free from all trace of antimony.

To separate also the arsenic, which remains in the state of sulpho-arseniuret of lead in the mass remaining from the first filtration, I digest it, at a gentle heat, with caustic ammonia, which converts the sulpho-arseniuret of lead into sulphuret of lead and sulphuret of arsenic, the latter of which is dissolved in the ammonia. To this filtered solution I add a little hydrochloric acid, and I add the precipitate of sulphuret of arsenic to the first obtained.

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* *Bulletin de l'Academie de Médicine.*

* *Journal de Pharmacie*, July, 1843.

IODISED SYRUP OF SARSAPARILLA.*

℞. Syrup of Sarsaparilla 50 grammes.
Iodide of potassium.. 1 ,,
Mix and dissolve.

Iodide of potassium has been, as is known, very much in vogue for several years, as a remedy for the testiary symptoms of syphilis, and numerous cases of success attest its efficacy in this intimate period of the venereal disease, in which it was formerly necessary to subject patients to prolonged treatment by mercury, too frequently without obtaining advantageous results.

This syrup is much employed by M. Ricord in his own practice.

This physician first administers three spoonfuls *per diem* (morning, noon, and night), then six, then nine, then twelve: as an average dose, six spoonfuls to be taken at three times in the course of the twenty-four hours.

Each dose should be taken in a glass of decoction of leaves of saponaria, hops, or sequine.

HYDRARGYRUM CUM CRETA.

Some days ago, I sent for a sample of hydrargyrum cum cretâ to a druggist in the environs of London, and received a sample which evidently, from its very light color, contained only an exceedingly small portion of mercury. I called on the vender (to whom I was unknown) and complained of its quality, and for my pains received a volley of insolence.

Thinking that such a case richly deserved exposure, I analysed this hydrargyrum cum cretâ, and found it to contain, in ten grains:—

℞ Mercury	1·9
Carbonate of lime	7·4
Moisture	0·7
	10·0

The greater part of the mercury in this hydrargyrum cum cretâ, directly the carbonate of lime was removed by acetic acid, ran into a globule; this is not the case when the article is properly prepared, unless heat is applied, and it shows that sufficient tritration has not been employed. It is in every respect as bad a sample as has ever fallen under my observation.

I must caution this druggist and others; much care is required in making this preparation of mercury, and I shall be on the look-out for similar samples.

October 20, 1843.

C. Watt, jun.

IV. REVIEWS AND NOTICES OF BOOKS.

ELEMENTARY INSTRUCTION IN CHEMICAL ANALYSIS. By Dr. C. Remigius Fresenius, Chemical Assistant in the Laboratory of Giessen. With a Preface by Professor Liebig.† Edited by J. Lloyd Bullock, Member of the Chemical Society, late of the Giessen and Paris Laboratories. London: John Churchill, Princes-street, Soho. 1843. 8vo. pp. 284.

We have much pleasure in calling the attention of those engaged in analytical chemistry

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[*] *Journal de Chimie Médicale*, August, 1843.

[†] We give this preface entire, as exhibtiing Liebig's opinion of the work:—

PREFACE BY PROFESSOR LIEBIG.

Dr. Fresenius conducts the course of elementary instruction, in mineral analysis, in the laboratory of the University of Giessen. During the last two sessions he has followed the method described in hi work, entitled, "Elementary Instruction in Qualitative Chemical Analysis." This method I can confidently recommend from my own personal experience to all who are desirous of obtaining instruction in inorganic analysis, for its simplicity, usefulness, and the facility with which it may be apprehended.

I consider Dr. Fresenius's work extremely useful as an introduction to Professor H. Rose's excellent manual, and for adoption in institutions where practical chemistry is taught, but it is especially adapted to the use of pharmaceutical chemists.

Further, a number of experiments and discoveries have been recently made in our to the work before us, which has already passed through two editions in Germany, and is consequently stamped with a character for usefulness.

It is in every way adapted to the wants of the student of chemical analysis; and, written as it is by one who has had such ample opportunities of judging of the kind of book required by this class could scarcely be otherwise.

But it is not to the student alone that it will be useful, nay, indispensable; but also to those whose numerous daily occupations preclude their devoting time to the perusal of more elaborate treatises—we allude to those connected with the various manufactures where chemical processes are in operation—and, indeed, we may add that the adept may gain some useful hints from it.

To those whose knowledge of this branch of science, however extended, has been acquired, not systematically, but, as the fowl gathers its food, here and there, we promise that this work will be of the greatest service, and, consequently, we cordially recommend it.

Even the best works devoted to chemical analysis are replete with imperfections, either from the omissions or commissions of the respective authors; and this work, possessing as it does for those to whom it is more particularly intended, less faults than some far more pretending ones, even those who possess the former will do well likewise to procure the latter.

That reading alone will never make a good analyst, is a conclusion at which we have long since arrived; for a man must, from his own experience, acquire a knowledge of so many *little* facts—too numerous to find places in works, and apparently too trivial—before he can attain proficiency; but, on the other hand, reading is essential, as it guides the student in his course, saves useless repetitions, and gives him a knowledge of the observations and labors of his fellow-laborers.

For this work, treating, as it does, and that very ably, of every branch of chemical science which is pregnant with importance in every country in which commerce thrives, on the perfection of which every other hinges, which has raised the science to its present rank among the sciences, and which has rendered it a most powerful weapon in the detection and prevention of fraud, we prophecy an extended course of usefulness.

But our space is short, and we sum up our opinion of this volume and those engaged in it as follows:—The system laid down in it is good; the writer, Dr. Fresenius, a clear-headed, talented, and practical man—eminently fitted for the task of writing a book on such a subject—and its translation has been intrusted to one who has performed his task in a manner which does him much credit, conveying his meaning in a way that those who read, however plain their understanding, may rise enlightened, with the feeling that they have perfectly understood what they have been perusing: to him the thanks of the British public are due; and that many a chemist, when toiling over the hot laboratory fire, will frequently thank him for having been saved some hours' labor, we have not the slightest doubt. The work has been carefully carried through the press, is surprisingly free from typographical errors, printed on excellent paper, and, altogether, very neatly got up.

We give our readers the benefit of the following extract:—

"Chemistry is that science which teaches us the knowledge of the elements of which our earth consists, their composition and decomposition, and, in general, their relation to each other. A special branch of this science is designated by the name of *analytical chemistry*, inasmuch as it has a definite object in view—viz., the analysis of compound bodies, and the determination of their constituent parts. If this determination of the constituent parts merely refers to their *nature*, the analysis is called *qualitative;* but, if the *quantity* of every single element is to be ascertained, the analysis is called *quantitative*. The object of the first, therefore, is to exhibit the constituent parts of an unknown substance in forms *already known*, so that these new forms admit of safe inferences as to the presence of the single elements. The value of its method depends on two circumstances—viz., it must attain the object in view infallibly, and in the quickest possible manner. Whereas it is the object of quantitative analysis to exhibit those elements rendered manifest by qualitative investigation, in such forms as admit of an exact determination of their amount.

"The ways and means by which these various objects are attained, differ, of course, materially from each other. The study of qualitative analysis must, therefore, be separated from that of quantitative analysis, and, as a matter of course, must precede it.

"After having thus generally defined the meaning and objects of qualitative analysis,

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laboratory, which have enabled Dr. Fresenius to give many new and simplified methods of separating substances, which will render his work equally welcome to those who already are familiar with the larger works on inorganic analysis.

JUSTUS LIEBIG.

we must now shortly consider, in the first place, the preliminary information which qualifies students to cultivate this science successfully, the rank which it occupies in the department of chemistry, the objects to which it extends, the advantages derived from it; and, in the second place, the main points whereon its study is based, and the principal branches into which it is distributed.

"In order to enter with any prospect of success upon qualitative experiments, the student must previously have acquired some knowledge of the chemical elements, and of their most important combinations, as well as of the principles of chemistry generally, together with a certain readiness in the apprehension of chemical processes. This practical art demands, moreover, strict order, great neatness, and a certain degree of skill in manipulations. If the pupil combines with these qualifications a habit, in all cases in which phenomena contrary to experience appear, of imputing, first the fault to himself, or rather to the absence of some condition or other indispensable to the success of the experiment—and a firm reliance on the immutability of the laws of nature cannot fail to create this habit—he possesses every requisite to render his study of analytical chemistry successful.

"Now, although chemical analysis is based on general chemistry, and cannot be cultivated without some knowledge of the latter, yet, on the other hand, we must consider it also as a kind of *corner stone*, upon which the entire structure of this science rests: for it is almost of equal importance for all branches of theoretical, as well as of practical chemistry; and we need not expatiate here on the utility and advantages which the physician, the apothecary, the mineralogist, the rational farmer, the artisan, and many others, derive from it.

"This alone would be a sufficient reason to recommend a thorough and diligent study of this science, if even its cultivation possessed none of those attractions which, I may safely assert, without fear of contradiction, it must of necessity possess for every one who devotes himself zealously and ardently to its acquisition. For the human mind is constantly striving for the attainment of truth; it delights in the solution of enigmas; and where do we meet with a greater variety of problems, of more or less difficult solution, than in the province of chemistry? But as a problem, an enigma, for which, after long pondering, we can find no solution, wearies and discourages the mind; so, in like manner, do all chemical investigations, if the object in view be not attained, if our results do not bear the stamp of truth—of unquestionable certainty. A half-knowledge is, therefore, in every province of science, but principally here, to be considered worse than no knowledge at all, and the student must therefore be especially warned against a mere *superficial* cultivation of chemical analysis.

"A qualitative experiment may be made with a two-fold view, viz., either, 1st., to prove that some definite body or other is or is not contained in a substance, e.g. lead in wine; or, 2nd., to ascertain *all* the constituents of a chemical combination or mixture. Any substance whatever may, of course, become the object of chemical analysis.

"In the present work, however, we purpose to confine ourselves to those elements and combinations which are employed in pharmacy, art, and trades."

FAMILIAR LETTERS ON CHEMISTRY, AND ITS APPLICATION TO COMMERCE, PHYSIOLOGY AND AGRICULTURE.

By Justus Liebig, M.D., Ph. D.D., F.R.S,, Professor of Chemistry in the University of Giessen. Edited by John Gardner, M.D., Member of the Chemical Society. London: Taylor and Walton, 1843. 12mo., pp. 179.

It has been the endeavor of Professor Liebig, in this little volume, to draw the attention of the political economist to chemistry as the best means of assistance in improving the state of the manufacturing interest and of society at large. These Letters "were intended to be mere sketches, and were written for the especial purpose of exciting the attention of governments, and an enlightened public, to the necessity of establishing schools of chemistry, and of promoting, by every means, the study of a science so intimately connected with the arts, and social well-being of modern civilised nations."

It appears that in Germany, some beneficial results have been produced by the publication of these Letters. "New professorships have been established in the Universities of Göttingen and Wurtzburg, for the express purpose of facilitating the application."

It is our sincere hope that this work may meet with the attention from our countrymen that it merits, and they will benefit by a careful study and application of its contents. It is a work for all classes, and there is no man who may not profit by it.

We have room for the following extract:—

"LETTER XII.

"SCIENCE AND ART OF AGRICULTURE.

"My dear Sir,—

"Having now occupied several letters with the attempt to unravel, by means of chemistry, some of the most curious functions of the animal body, and, as I hope, made clear to you the distinctions between the two kinds of constituent elements of food, and the purposes they severally subserve in sustaining life, let me now direct your attention to a scarcely less interesting and equally important subject—the means of obtaining from a given surface of the earth, the largest amount of produce adapted to the food of man and animals.

"Agriculture is both a science and an art. The knowledge of all the conditions of the life of vegetables, the origin of their elements, and the sources of their nourishment, forms its scientific basis.

"From this knowledge we derive certain rules for the exercise of the ART, the principles upon which the mechanical operations of farming depend, the usefulness or necessity of these for preparing the soil to support the growth of plants, and for removing every obnoxious influence. No experience, drawn from the exercise of the art, can be opposed to true scientific principles, because the latter should include all the results of practical operations, and are in some instances solely derived therefrom. Theory must correspond with experience, because it is nothing more than the reduction of a series of phenomena to their last causes.

"A field in which we cultivate the same plant for several several successive years becomes barren, for that plant in a period varying with the nature of the soil; in one field it will be three, in another seven, in a third twenty, in a fourth in a hundred years. One field bears wheat and no peas; another beans or turnips, but no tobacco; a third gives a plentiful crop of turnips, but will not bear clover. What is the reason that a field loses its fertility for one plant, the same which at first flourished there? What is the reason one kind of plant succeeds in a field where another fails?

"*These questions belong to Science.*

"What means are necessary to preserve to a field its fertility for one and the same plant? What to render one field fertile for two, for three, for all plants?

"*These last questions are put by Art, but they cannot be answered by Art.*

"If a farmer, without the guidance of just scientific principles, is trying experiments to render a field fertile for a plant which it otherwise will not bear, his prospect of success is very small. Thousands of farmers try such experiments in various directions, the result of which is a mass of practical experience forming a method of cultivation which accomplishes the desired end for certain places; but the same method frequently does not succeed, it indeed ceases to be applicable to a second or third place in the immediate neighbourhood. How large a capital, and how much power, are wasted in these experiments! Very different, and far more secure, is the path indicated by SCIENCE; it exposes us to no danger of failing, but, on the contrary, it furnishes us with every guarantee of success. If the cause of failure—of barrenness in the soil for one or two plants—has been discovered, means to remedy it may readily be found.

"The most exact observations prove that the method of cultivation must vary with the geognostical condition of the subsoil. In basalt, graywacke, porphyry, sandstone, limestone, &c., are certain elements indispensable to the growth of plants, and the presence of which renders them fertile. This fully explains the difference in the necessary methods of culture for different places; since it is obvious that the essential elements of the soil must vary with the varieties of composition of the rocks, from the disintegration of which they originated.

"Wheat, clover, turnips, for example, each require certain elements from the soil; they will not flourish where the appropriate elements are absent. Science teaches us what elements are essential to every species of plants by an analysis of their ashes. If, therefore, a soil is found wanting in any of those elements, we discover at once the cause of its barrenness, and its removal may now be readily accomplished.

"The empiric attributes all his success to the mechanical operations of agriculture, he experiences and recognises their value without inquiring what are the causes of their utility; their mode of action; and yet this scientific knowledge is of the highest importance for regulating the application of power and the expenditure of capital,—for insuring its economical expenditure and the prevention of waste. Can it be imagined that the mere passing of the ploughshare or the harrow through the soil—the mere contact of the iron—can impart fertility miraculously? Nobody, perhaps, seriously entertains such an opinion. Nevertheless, the *modus operandi* of these mechanical operations is by no means generally understood. The fact is quite certain, that careful ploughing exerts the most powerful influence: the surface is thus mechanically divided, changed, increased, and renovated; but the ploughing is only auxiliary to the end sought.

"In the effects of time, in what in Agriculture are technically called *fallows*—the repose of the fields—we recognise by science certain chemical actions, which are continually exercised by the elements of the atmosphere upon the whole surface of our globe. By the action of its oxygen and its carbonic acid, aided by water, rain, change of temperature, &c., certain elementary constituents of rocks, of their ruins, which form the soil capable of cultivation, are rendered soluble in water, and, consequently, become separable from all their insoluble parts.

"These chemical actions, poetically denominated 'the tooth of time,' destroy all the works of man, and gradually reduce the hardest rocks to the condition of dust. By their influence the necessary elements of the soil become fitted for assimilation by plants; and it is precisely the end which is obtained by the mechanical operations of farming. They accelerate the decomposition of the soil, in order to provide a new generation of plants with the necessary elements in a condition favorable to their assimilation. It is obvious that the rapidity of the decomposition of a solid body must increase with the extentiou of its surface; the more points of contact we offer in a given time to the external chemical agent, the more rapid will be its action.

"The chemist, in order to prepare a mineral for analysis, to decompose it, or to increase the solubility of its elements, proceeds in the same way as the farmer deals with his fields—he spares no labor in order to reduce it to the finest powder; he separates the impalpable from the coarser parts by washing, and repeats his mechanical bruising and trituration, being assured his whole process will fail if he is inattentive to this essential and preliminary part of it.

"The influence which the increase of the surface exercises upon the disintegration of rocks, and upon the chemical action of air and moisture, is strikingly illustrated upon a large scale in the operations pursued in the gold-mines of Yaquil, in Chili. These are are described in a very interesting manner by Darwin. The rock containing the gold ore is pounded by mills into the finest powder; this is subjected to washing, which separates the lighter particles from the metallic; the gold sinks to the bottom, while a stream of water carries away the lighter earthy parts into ponds where it subsides to the bottom as mud. When this deposit has gradually filled up the pond, this mud is taken out and piled in heaps, and left exposed to the action of the atmosphere and moisture. The washing completely removes all the soluble parts of the disintegrated rock; the insoluble parts, moreover, cannot undergo any further change while it is covered with water, and so excluded from the influence of the atmosphere at the bottom of the pond. But, being exposed at once to the air and moisture, a powerful chemical action takes place in the whole mass, which becomes indicated by an efflorescence of salts covering the whole surface of the heaps in considerable quantities. After being exposed for two or three years, the mud is again subjected to the same process of washing, and a considerable quantity of gold is obtained, thus having been separated by the chemical process of decomposition in the mass. The exposure and washing of the same mud is repeated six or seven times, and at every washing it furnishes a new quantity of gold, all its amount diminishes every time.

"Precisely similar is the chemical action which takes place in the soil of our fields; and we accelerate and increase it by the mechanical operations of agriculture. By these we sever and extend the surface, and endeavour to make every atom of the soil accessible to the action of the carbonic acid and oxygen of the atmosphere. We thus produce a stock of soluble mineral substances, which serve as nourishment to a new generation of plants, and which are indispensable to their growth and prosperity."

In conclusion, we may add that the work is well translated by Dr. Gardner.

LECTURES ON POLARIZED LIGHT, DELIVERED BEFORE THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN; AND IN THE MEDICAL SCHOOL OF THE LONDON HOSPITAL. By Jonathan Pereira, M.D., &c., &c., &c. Illustrated by above fifty wood-cuts. London: Longman and Co., 1843, 8vo., pp. 110.

At first sight, it may appear somewhat extraordinary that a course of lectures on polarized light should be delivered before an association of pharmaceutical chemists;—indeed, we think that in this instance the lectures were premature, being addressed to those who had not previously been rendered capable of appreciating them;—but a more mature consideration will convince the doubtful of the beneficial results to be anticipated from a practical application of this beautiful branch of science.

The following extract from the first lecture will explain to our readers the utility of the applications of polarized light:—

"I am acquainted with no branch of experimental philosophy capable of presenting such brilliant and gorgeous phenomena, and which are so well adapted to illustration in the lecture-room, as polarized light. In its power of unfolding to our view the intimate structure and constitution of natural bodies, it certainly has no superior, if indeed, it have any equal. It furnishes us with characters for recognising and distinguishing many bodies, and it gives us the means of determining the nature of the changes going on in some of the recondite operations of nature. It is a subject whose phenomena are so complicated and intricate, that it not only admits of, but actually requires, the highest departments of mathematics to elucidate them; and it is, therefore, very properly placed in the very first rank of the physico-mathematical sciences.

"But in all societies and associations, the lovers of knowledge are of two kinds—philosophers and utilitarians. The first pursue science for its own sake; the second, for its usefulness. With the latter, every step they take in the acquirement of knowledge is accompanied with the question "*cui bono?*" With such, all scientific researches which have no immediately practical bearing, which, according to their narrow views, cannot be at once shown to be *useful*, are neglected, perhaps even sneered at. Though with such I profess to hold no community of feeling; yet, as I am desirous of combining in these lectures, the *utile* with the *dulce*, I think I can venture to hold out to them ample remuneration for the time they may devote to the study of polarized light, by attending these lectures.

"If I can show them that this agent furnishes us with a more intimate knowledge of the nature and properties of those substances, by the commerce in which most of the Members of this Society gain their bread; if I can demonstrate its applicability to the detection of the adulteration of foods, drugs and chemicals; if I can point out its application to the determination of the commercial value of saccharine juices; if I show how it has been applied to determine the nature of the changes which occur in certain chemical and vital processes, in which ordinary chemical analysis completely fails; if I prove that it may aid members of my own profession in detecting the existence of certain diseases; and, lastly, if we show the possibility of its use to the mariner in aiding him, under certain circumstances, to avoid shoals and rocks—I trust even the utilitarians will admit that the study of polarized light is both advantageous and profitable, and that the time of this Society has not been unprofitably occupied by these lectures.

"These are only a portion of the valuable and practical uses of which polarized light is susceptible. Its phenomena are so intricate, and at present so little understood by the public, that a very large number of persons, who might otherwise, perhaps, beneficially avail themselves of its surfaces, are ignorant alike of its powers and its uses. We may, therefore, hope, that when it becomes better known, it will be found more extensively useful."

It is quite unnecessary to give an analysis of the contents of this volume; suffice it to say, that the subject is ably treated of, and that it is worthy of its author, and is handled with all his ability. It has our cordial recommendation.

THE ELECTRICAL MAGAZINE. PART II. Edited by CHARLES V. WALKER, Esq.

THIS work claims a line of recognition. Its contents entitle it to the support it has received.

THE MEDICAL TIMES.

AFTER three weeks' consideration, the Editor of the "*Medical Times*" has again assailed us with two columns of abuse, which, for vulgarity, none but himself can equal. A more amusing piece of editorial absurdity we have seldom perused. It carries the strongest internal evidence of having been written by a man in so violent a passion as to have but a very confused idea of the object he had in view; in his wrath he has composed a hasty medley of ill-strung, disjointed, and unconnected sentences, intended to effect the utter annihilation of the terrified Editors of THE CHEMIST.

We know not which of the three conductors of this weekly medical *olla podrida* has thus so kindly and delicately transmitted our names to the trunk-makers, cheesemongers, and tallow-chandlers of no very distant period; but, from certain peculiarities of style, from its newspaper-hack elegance of diction, and from an allusion to the law of libel and *costs*—the El-dorado of the legal profession—we suppose that it is the "barrister" whom we have to thank for this signal mark of condescension, this rescuing of our patronymic from oblivion.

This gentleman (for such we have *his own authority* for calling him) has for a long time been very angry with the *Lancet*, and has even deigned to notice its failings, albeit without malignity, without any sinister motives: his amiable disposition knows not these; in attacking the *Lancet*, his sole and very charitable object was to dissuade a large portion, if not the whole, of the medical profession, from buying and reading a journal so depraved, while they might obtain the *Medical Times*, which contains "more and better matter," at half the price. It is galling to see men wasting their money—

giving 8d. for something *inferior* to that which "we" could supply for 4d!!

Again, the gentleman (how we delight in the repetition) has attacked Lord Brougham in an obscure Sunday paper, and brags of the feat; in this instance the learned gentleman displayed much of the coarseness of habitual newspaper writers, and the venom and vulgarity—without the talent—of a "Publicola."

Now, we are not grateful for the notice with which we have been honored by the *Medical Times.* What can a member of the legal profession know about chemistry or chemical journals? His opinion of THE CHEMIST' was as uncalled for and as intrusive as it was undesired and despised. A lawyer, or any other man, may edite the *Medical Times*, made up, as it is, of abstracts of lectures—supplied by the lecturers themselves—on subjects with which the medical profession is already well acquainted, of gleanings from other journals, and of reviews given for the sake of taking long extracts.*

In replying to the observations which we made in our last number, the 'barrister' (and reporter to the *Law Times*, &c.), omitted to inform us by what ingenious process he swelled into *six* pages the page and a half of matter which we took from his journal; the secret should be published for the benefit of all editors; it would be invaluable in cases of "shortness of matter." We confess our curiosity to learn it. Did he regard it through his *eyeglass?* If so, perhaps he has regarded our sin and his own excellence through the same magnifying medium.

In a recent prefatory article, the same eminent writer has dilated on the superiority, and especially on the *gentility* of the present conductors as compared with the former ones; and this with as much independence of grammar as absence of good feeling.

Since this alteration—" Not only have that proprietorship and editorship been entirely got rid of, but its size has been enlarged; new type and better paper *has*† been employed; and its management has been placed under GENTLEMEN (in small capitals)." It is gratifying to hear that it is managed by gentlemen; we admire the judgment displayed by the writer in telling us so, for the fact would never have been discoverable by reading the editorial articles.

This preface concludes with an elegant and winning supplication to advertisers, begging them not to overlook the many and rare excellences of the *Medical Times*, beheld, perhaps, through the above-mentioned magnifier of Mr. Healey's views. On this fascinating topic he is absolutely eloquent.

In future, we shall allow this "gentleman's" waspishness and malice to pass as unnoticed as they will be unheeded, and shall leave him to vent his spleen, in his own peculiar English, in the *Medical Times*, which, to use the expression of a person *connected with it*, "lives by its abuse." We are quite aware that his vanity is flattered—although his temper is ruffled—by the notice we have bestowed on his insignificance: but we will not suffer him to gratify his love of notoriety through the medium of THE CHEMIST.

In dismissing the subject we may apologise to our readers for having intruded on their notice anything so repulsive. We hope that, when passion shall have subsided, and when reason shall have resumed "her seat in his distracted brain," this irascible editor will perceive, and regret, the folly and impolicy of his conduct, and learn to behave with more courtesy to his equals, *at least*, in birth and education, and, above all, in making accusations, to adhere more strictly to truth than, we are sorry to say, he has done on this occasion.

A NEW SERIES OF TABLES OF THE ELEMENTARY AND COMPOUND BODIES, SYSTEMATICALLY ARRANGED, AND ADAPTED AS TABLES OF EQUIVALENTS, OR AS CHEMICAL LABELS. By CHAS. BUTTON and WARREN DE LA RUE. Part I. London: De la Rue and Co., 110, Bunhill-row, 1843. Royal quarto.

THIS part contains the simple bodies, oxides, chlorides, iodides, bromides, fluorides, sulphurets, phosphurets, seleniurets, tellurets, arsenurets, carburets, and the compounds of ammonium.

Each label has the name of the substance in large and very distinct black characters, with the symbol according to Liebig and Gregory, and the equivalents of Berzelius, Liebig, and Brande.

We unhesitatingly give to these tables our unqualified approbation, and we hope and believe that these labels will prove of equal advantage to the adept and the learner, supplying information which would have to be sought in various sources, and affording to the student a great auxiliary to the acquisition of a knowledge of chemical notation.

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* In the Students' number the whole of Dr. Venables' work on *Aërated Waters*, is given with the exception of a very little.

† May we remind Mr. Healey that the plurality of the nominative case extends to the verb which it governs? Further information may be obtained from a grammar.

No laboratory will be complete without these tabular labels.

BOOKS RECEIVED.

New and Simple Methods of Ascertaining the Commercial Value of Alkalies, Acids and the Oxides of Manganese. By Drs. **Fresenius** and **Will**, Chemical Assistants in the Laboratory of the University of Giessen. Edited by J. **Lloyd Bullock**, Member of the Chemical Society, and late of the Giessen and Paris Laboratories. London: Taylor and Walton, Upper Gower-street. 1843.

Applied Chemistry in Manufactures, Arts, and Domestic Economy. Edited by E. A. Parnell, with numerous engravings on wood, and other Illustrations. London: Taylor and Walton. Part I.

[These two books will be noticed in our next number.]

TO OUR SUBSCRIBERS.

The next number of **The Chemist**, completing the volume, will contain an Index, Introduction, &c.

Early application for the volumes (which will be ready by the 4th December), is requested, as very few copies of the numbers for the present year remain on hand.

TO CORRESPONDENTS.

A **Constant Reader**.—Some remarks on the sulphate of potassa were written, but accidentally omitted this month. However, the following article will be of some use, as showing the nature of impurities. Mr. Mowbray (*Med. Gaz.*, Oct. 27) says, "that the injurious effects of sulphate of potassa may be entirely traced to irritation, caused by the spiculæ of the undissolved salt—an opinion partly suggested by the fact of Chevallier having found portions of this salt, *undissolved*, in the stomach and intestines of an individual poisoned by it.

We will give the subject full consideration, and give our readers a decided opinion in our next number.

"In the course of last year, various journals published some serious symptoms observed in consequence of the administration of this salt, frequently employed as a gentle anti-lactic purgative.

"Quite recently Mr. Moritz, of Neufbrisach, published in the *Journal de Pharmacie*, an observation, and of which long experience had shown him the correctness, namely, that the sulphate of potassa, that which comes from Germany, where it is the secondary product of the manufacture of nitric acid, often contains sulphate of zinc, and sometimes sulphates of iron and copper.

It is easy for the chemist to assure himself of the purity of sulphate of potassa which he may buy in commerce, and I think that the following *tests* will always be sufficient for dissipating his fears and covering his responsibility. In our opinion, sulphate of potassa, the æqueous solution of which has no action on the color of litmus and syrup of violet, and which is neither colored nor rendered turbid by ammonia, hydrosulphate of ammonia, or gallic acid, may be regarded as sufficiently pure for medical use. However, if it be considered that arsenic should be sought for in this salt, recourse must be had to Marsh's apparatus."—*Journal de Chimie Medicale,* October, 1843.

A **Naval Surgeon** shall hear from us privately if he will enable us to address him; or, if he will call at our office, after the 2nd inst., he will have a letter.

Other correspondents will be good enough to send us the means of addressing them privately.

Numerous correspondents answered by post.

Mr. Thompson's Meteorological Summary is unfortunately mislaid.

ERRATA IN THE PRESENT NUMBER.

In Mr. Mowbray's article, page 508, col. 1, line 28, from bottom, for "Dr." read "Mr.," also, same line, for "hyoscyaine" read "hyosciami."

Nota Bene.—*All Communications, Books for Review, and Substances to be Analysed, must be addressed "To the Editors of The Chemist,* 310, *Strand, London." Communications must be pre-paid, and sent before the* 15*th of each Month; Books for Review before the* 10*th.*

THE CHEMIST.

I. CHEMISTRY.

ON THE TRUE CONSTITUTION OF NITROGEN.*

BY REUBEN PHILLIPS.

(*Continued from page* 493.)

Regarding nitrogen as an isomeric modification of carbonic oxide, a strong heat should probably resolve it, and an equivalent of oxygen, into carbonic acid: to put this opinion to the test, the following experiments were performed:—

NINTH EXPERIMENT.

Some air was confined in a glass tube over a solution of lime, and a series of discharges, from a large Leyden jar, transmitted through the gases for an hour. The points were of copper, and the tube was of German glass, nearly $\frac{4}{10}$ of an inch internal diameter. About midway between the two points there appeared on the glass some opaque, white spots, which when the lime water was washed over them, could be seen to impart a milky appearance; all, however, could not be washed off. The same experiment was again repeated, with a greater number of sparks, from the same sized jar, and a larger quantity of matter was formed on the side of the tube: the lime water was then poured off, and a solution of hydrochloric acid admitted, which instantly cleared the glass.

I inferred from the fact in the above experiment, that spots were formed on the tube, and not a general dulness; that sparks, passing through the above gaseous mixture, produce no chemical effect, unless very close to, or running on, the lime solution; and that, at the places where the spots were produced, the flash struck the glass. Subsequent experiments have confirmed this idea: hence, the necessity, in future experiments of this nature, of keeping the points close to the glass, and also of keeping the glass between the points duly moistened with the solution.

TENTH EXPERIMENT.

A charge, from a Leyden battery, sent across a plate of glass wetted with lime water, and exposed to the air, left between the points a streak.

Thinking it possible that sparks from the prime conductor might be substituted for the discharges of the Leyden jar in experiment nine, I made the following trial:—

ELEVENTH EXPERIMENT.

A number of sparks, from the prime conductor, passed through air, over lime water, in the same apparatus used in experiment nine, produced no opacity.

Conceiving from experiment nine, that the affinity of lime for carbonic acid is connected with the formation of the solid matter, it seemed to me reasonable to conclude that, probably, by the substitution of bodies possessing a higher attraction for carbonic acid than lime does, a larger supply of the white substance might be obtained.

TWELFTH EXPERIMENT.

A mixture of the solutions of potassa, baryta, and lime—employed instead of a solution of lime, as in experiment nine, all other circumstances being the same, with the exception that both points rested on the side of the tube, and in a line as near as could be judged parallel to its axis—gave a more abundant supply of solid matter than did experiment nine. It being considered not impossible that the heat, caused by the passing of the electric spark, might evaporate the water at those places where the white substance was produced, and thereby cause its production by the simple subtraction of water: I undertook the two following experiments.

THIRTEENTH EXPERIMENT.

Above ninety discharges from a Leyden jar passed through the apparatus, used in the former experiment, the alkaline solution being replaced by a solution of plaster of Paris, no perceptible opacity was produced. To enable me better to ascertain the value of

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* Communicated by the Author.

N. S. Vol. I.—*No. XII., December*, 1843.

this experiment, the solution of sulphate of lime was replaced by a mingled solution of the nitrates of baryta, potassa, and lime, and six discharges from the same jar transmitted, produced a nearly continuous opaque white streak, about half an inch long, and greatest width about $\frac{1}{20}$ of an inch.

I hope by a solution somewhat similar to that last used, to obtain such a quantity of the white substance as will enable me to make some decisive experiments as to its nature.

FOURTEENTH EXPERIMENT.

Upwards of fifteen discharges, from the Leyden jar used in the last experiment, sent across a saturated solution of sulphate of potassa, spread upon a plate of glass, produced no perceptible effect on the saline solution.

From experiments 13 and 14, it certainly follows that the subtraction of water by the electric spark is not the cause of the production of the white matter; and I am aware of no hypothesis, but that supplied by the experiments detailed in my last paper, capable of affording any explanation of the phenomenon; but by the aid of that hypothesis the experiments detailed in this paper and in the former become connected and intelligible.

I hope that I shall next month adduce more evidence in support of the above hypothesis, much of which I hoped to have brought forward in this paper. I conclude, for the present, by observing that the day is possibly not far distant when the air itself shall be to us an inexhaustible source of most valuable fuel.

INVESTIGATIONS CONCERNING THE CHEMICAL COMPOSITION OF TEA.*

BY EUGENE PELIGOT.

It is known that the most remarkable products which have been found in tea are:—

1. Tannin;

2. An essential oil, to which it owes its aroma, and which has great influence on its commercial value;

3. A crystallizable substance very rich in nitrogen, *theïn*, which is likewise found in coffee (in which it is often designated by the name of *caffeïn*), and which also exists in *guarana*, a medicine held in high estimation by the Brazilians.

Independently of these three bodies, Mulder extracted from tea eleven substances, which, moreover, enter into the composition of all leaves. This chemist found in different kinds of tea from China and Java, rather less than $\frac{1}{2}$ of theïn per 100 of their weight.

Mr. Stenhouse, in a recent work, found in 400 parts of tea from 1·27 to 0·98 of theïn.

Nothing being more important to the chemical and physiological history of tea than the accurate knowledge of the nitrogenous principles which it contains, I first determined the total amount of nitrogen which this leaf contains, thus seeking a sure guide for afterwards isolating the matters into which this nitrogen is divided.

By estimating the nitrogen in the state of gas, by Dumas' process, I obtained the following numbers:—

Pekoe tea	6·58	nitrogen in 100 of tea,	dried at 230° F.
Gunpowder tea........	6·15	,,	,,
Souchong	6·15	,,	,,
Assam................	5·10	,,	,,

This proportion of nitrogen is much more considerable than that which has been found in any of the vegetables hitherto analysed. Now, it is known that the proportion of this element has been determined by M. Boussingault, as regards most of the esculent plants, and by Boussingault and Payen for a very great number of vegetables employed as manures.

These first experiments, therefore, show the existence in tea of from 20 to 30 per cent. of nitrogenous matters, whilst former analyses did not make the proportion amount to more than three or four hundredths: I successively sought for these matters in the products of the leaf soluble in boiling water, in the products which water does not dissolve, and in each of the substances which may be separated either from this infusion, or from the exhausted leaf; thus, I proceeded by elimination, and I was constantly guided in this investigation by the quantity of nitrogen contained in these products, taken together and separately.

I first determined the proportion of soluble products which tea yields to boiling water. I operated on twenty-seven kinds of tea, taking account of the water which the leaf already contained, either because its desiccation in China had not been complete, or because it had absorbed during or after its transport a certain quantity of atmospheric water; I found that green teas contain, on the average, 10, and black teas 8 per cent. of water.

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* *Comptes Rendus.*

The proportion of products soluble in warm water varies very considerably, and depends, especially, on the age of the leaf, which is younger, and, consequently, less ligneous in green tea than in black. I give in my memoir the numbers which express this proportion for each kind of tea; on the average, I obtained :—

From 100 parts :

Of dry black teas..............	43·2	parts, soluble	in boiling water.
Of dry green teas..............	47·1	„	„
Of black teas taken in their commercial state	38·4	„	„
Of green teas in the same state ..	43·4	„	„

When an infusion of tea is evaporated to dryness, a chocolate-brown residue remains; which, when it is obtained from gunpowder tea, contains 4·35 of nitrogen in 100 parts.

The same residue, furnished by souchong black tea, contains 4·70 of nitrogen per cent.

Do these considerable quantities of nitrogen belong to several principles of the infusion, or only to the theïn, which is the only nitrogenous body which has been observed in it? I at once set about solving this question. As the estimation of theïn is a difficult operation, this substance being soluble in water, alcohol, and ether, and, being precipitable by no reagent except tannin, I first ascertained whether the other substances which can be separated from the infusion of tea contain nitrogen.

Subacetate of lead precipitates from this infusion about half of the soluble principles which it contains. The precipitate, which is of a more or less deep yellow as it is obtained from black or green tea, contains all the coloring matter, all the tannin, and a peculiar acid which gives an insoluble salt, of a chamois yellow, with subacetate of lead. I have not yet completed the examination of this acid.

I have proved that this complex precipitate contains only an insignificant quantity of nitrogen. It is, therefore, in the non-precipitable portion of the infusion that the substances containing this element must be sought for.

To estimate theïn, Mulder evaporates the infusion with caustic magnesia, and treats the residue by ether, which dissolves only the theïn. By modifying this process, which still remains very imperfect, for several reasons which I have given in my memoir, I obtained the following quantities of theïn from 100 parts of:—

Hyson tea	2·40
Another sample	2·56
Mixture of equal parts of gunpowder, hyson, imperial, caper, and pekoe	2·70
Gunpowder..................	4·1
Another sample	3·5

These quantities are much greater than those which were obtained by Mulder, or by Mr. Stenhouse; they are, nevertheless, insufficient for representing, in the state of theïn, all the nitrogen of the infusion; for, the composition of theïn being represented by the formula $C^8H^{10}N^2O^2$, and this substance containing 29·0 per cent. of nitrogen, gunpowder tea should contain 7·4, and souchong 6·5 of theïn in 100 parts of these teas, taken in their ordinary state, if no other nitrogenous matter accompanies the theïn in the solution.

By means of the very simple process which I am about to point out, I have been enabled to estimate a more considerable proportion of theïn than I had at first obtained. Subacetate of lead is added to the warm infusion of tea, then ammonia; a current of hydrosulphuric acid is driven into the liquor, separated by filtration from the precipitate which is formed, and the liquid, freed from sulphuret of lead, is evaporated at a gentle heat; by cooling, an abundant crystallization of theïn is obtained, and a mother liquor, which furnishes new crystals by careful evaporation. The first crystals are purified by making them crystallise in water, and their mother liquor is used for dissolving the second, so as to have, by methodical crystallizations, as little mother liquor and as much crystals as possible. By proceeding thus, I obtained from 5·00 (grammes) of gunpowder tea 1·92 of crystallized theïn, or 3·84 per cent.

But there remains a syrupy liquid which also contains theïn; I estimated this substance by means of a solution of tannin of known strength, which precipitates it alone, and, I think, completely, provided that the liquor be cold and exactly neutralised by ammonia, in proportion as the tannin is poured into it.

By adding the new quantity of theïn, isolated by this reagent, to that which has been crystallized, 100 parts of gunpowder tea, taken in its ordinary state, furnished 5·84 of theïn; 100 parts of the same tea, in the dry state, yielded 6·21 of this substance. These numbers very nearly approach those which should be obtained if theïn were the only nitrogenous matter contained in infusion; nevertheless, there still remains 0·75 of nitrogen to be accounted for; but it must be remarked that I could obtain only a minimum. It is, besides, possible that there may be ammoniacal salts in this infusion, or else a small portion of theïn may be decomposed during the evaporation of the liquor. This substance being of very easy alteration, like the substances very rich in nitrogen which it resembles in composition and properties.

Be this as it may, it may be concluded from these experiments:—First, that theïn is the principal nitrogenous matter contained in the infusion of tea; second, that it exists in it in much more considerable quantity than had hitherto been admitted.

The portion of tea which no longer yields any soluble principle to boiling water, contains, in 100 parts dried at 230 F., 4·46 of nitrogen for souchong, and 4·30 for gunpowder tea.

These quantities, added to those of the infusion, very nearly represent the nitrogen found by analysis in the entire leaf.

By boiling for some time the leaves exhausted with water, containing a tenth of their weight of potassa, a brown liquor is obtained, which furnishes, by the addition of dilate sulphuric or acetic acid, an abundant brown and floculent precipitate, which contains 8·45 of nitrogen per cent.; the product of another preparation gave 9·93. Alcohol and ether remove from this precipitate about 30 per cent. of a green substance, which appears to contain an acid of a fatty nature: thus treated, this product is not yet pure, for it is deeply colored, and contains pectic acid; nevertheless, that which contained 8·45 of nitrogen furnished 11·35 of this element, after the treatment by alcohol and ether. Although I have not been able to obtain this substance in the state of purity, I do not hesitate to consider it, from the whole of its characters, as identical with the *caseïn* of milk.

It is probable that this body is found in the insoluble portion of the leaf in combination with the tannin, and that the potassa acts by destroying this combination.

The existence of this matter in tea, is a fact so much the more worthy of interest, as it is found in it in very considerable proportion if, as is probable, the greater part of the nitrogen contained in the exhausted leaf belongs to it. Admitting, indeed, with Dumas and Cahours, 16 per cent. of nitrogen in caseïn, the exhausted leaves would contain no less than 28 hundredths of this matter: tea, in its ordinary state, would contain 14 or 15 per cent.

I was not able to separate from tea the whole of this caseïn. I obtained, in one experiment, from 100 of exhausted leaves 35 of the mixture I have mentioned, containing from 8 to 10 per cent. of nitrogen, which represents from 18 to 20 of caseïn supposed to be pure; but the leaves, after two treatments by potassa, still contained 2·73 of nitrogen per cent.; this nitrogen, supposed to be in the state of caseïn, represents 5·7 of this matter; so that we thus arrive almost at the porportion indicated by the determination of the nitrogen.

It will be seen, by summing up these experiments, that tea contains a perfectly exceptional proportion of nitrogen; but it must be borne in mind that this leaf is not taken in its natural state, and that it comes to us after having been, as we may say, manufactured. It is known, indeed, that before being sold for consumption, tea undergoes a torrefaction which softens the leaf, and which allows of a very abundant bitter, and slightly corrosive juice being pressed from it by means of pressure exerted by the hands; the leaf is afterwards rolled and dried more or less rapidly, according to whether green or black tea is to be prepared. Now, it is possible that this juice may contain little or no nitrogen, and that its separation may augment, consequently, the quantity of nitrogen which remains in the leaf. By determining that which is found in the fresh leaves of the tea trees cultivated in the neighbourhood of Paris, in the beautiful nurseries of MM. Cels, I found 4·37 of nitrogen per cent. of dried tea. Perhaps the difference of climate and of culture may be sufficient to produce these variations.

I conclude this work by some considerations concerning the employment of tea considered as a drink, and as an aliment. It cannot be denied, in presence of the proportion of nitrogen contained in this leaf, and of the existence of caseïn, that tea is a true aliment when it is consumed entire, with or without previous infusion, as is the practice, we are assured, of some Indian populations.

Thus, we read in a letter of Victor Jacquemont:—

"Tea comes to Cachmire by caravans, through Chinese Tartary, and Thibet. It is prepared with milk, butter, salt, and *an alkaline salt of a bitter taste.* At Kanawer it is made in another manner; the leaves are boiled for an hour or two, then water is added, and the leaves are dressed with rancid butter, &c." Is it not evident, that, in the first preparation, the instinctive employment of the alkaline salt has for its object to dissolve the caseïn, and to make it enter into the infusion, whilst, in the second, this caseïn remains, and is consumed with the leaf itself? But it is not thus that tea is prepared among more civilised nations: should it be admitted that this infusion, made with little tea and much water, acts otherwise on our nervous system, than by producing a superexcitation which may take the place, for a certain time, of true nourishment? Without seeking to solve these difficult questions, I have determined some of the elements which should be considered in their discussion; I have especially ascertained the weight and the nature of the principles which enter into the infusion of tea as it is habitually prepared for drink. Tea is not then deprived of all its soluble principles; the leaf still retains at least one-third of what it yields to water when submitted to repeated washings; an infusion, for example, made with 20 grammes of gunpowder tea and one quart of water, furnished 6 gr. 33 of soluble products, containing nearly 1 gramme of theïn.

AN EFFORT TO REFUTE THE ARGUMENTS ADVANCED IN FAVOR OF THE EXISTENCE, IN THE AMPHIDE SALTS, OF RADICALS CONSISTING, LIKE CYANOGEN, OF MORE THAN ONE ELEMENT.*

BY ROBERT HARE, M.D., PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF PENNSYLVANIA.

(*Concluded from page* 493.)

LXVII. On subjecting a solution of sulphate of soda to electrolysis, so as to be exposed to the current employed, simultaneously with some water in a voltameter, Daniell alleges, that, for each equivalent of the gaseous elements of water evolved in the voltameter, there was evolved at the cathode and anode, not only a like quantity of those elements, but likewise an equal number of equivalents of soda and sulphuric acid. This he considers as involving the necessity, agreeably to the old doctrine, of the simultaneous decomposition of two electrolytic atoms in the solution, for one in the voltameter; while, if the solution be considered as holding oxysulphionide of sodium, instead of sulphate of soda, the result may be explained consistently with the law ascertained by Faraday. In that case, oxysulphion would be carried to the anode, where, combining with hydrogen, it would cause oxygen o be extricated, while sodium, carried to the cathode, and deoxidising water, would cause the extrication of hydrogen.

LXVIII. Dr. Kane, alluding to the experiments above mentioned, and some others which I shall mention, alleges that "*Professor Daniell considers the binary theory of salts to be fully established by them.*"

LXIX. Notwithstanding the deference which I have for the distinguished inventor of the constant battery, and disinclination for the unpleasant task of striving to prove a friend to be in the wrong, being of opinion that these inferences are erroneous, I feel it to be my duty, as a teacher of the science, to show that they are founded upon a misinterpretation of the facts appealed to for their justification.

LXX. It appears to me, that the simultaneous appearance of the elements of water, and of acid and alkali, at the electrodes, as above stated, may be accounted for, simply by that electrolysation of the soda, which must be the natural consequence of the exposure of the sulphate of that base in circuit. I will, in support of the exposition which I am about to make, quote the language of Professor Daniell, in his late work, entitled, "Introduction to Chemical Philosophy," page 413:—

"Thus we may conceive that the force of affinity receives an impulse which enables the hydrogen of the first particle of water, which undergoes decomposition, to combine momentarily with the oxygen of the next particle in succession; the hydrogen of this again with the oxygen of the next; and so on till the last particle of hydrogen communicates its impulse to the platinum, and escapes in its own elastic form."

LXXI. The process here represented as taking place in the instance of the oxide of hydrogen, takes place, of course, in that of any other electrolyte.

LXXII. It is well known that when a fixed alkaline solution is subjected to the voltaic current, that the alkali, whether soda or potassa, is decomposed; so that if mercury be used for the cathode, the nascent metal, being protected by uniting therewith, an amalgam is formed. If the cathode be of platinum, the metal, being unprotected, is, by decomposing water, reconverted into an oxide as soon as evolved. This shows, that when a salt of potassa or soda is subjected to the voltaic current, it is the alkali which is the primary object of attack, the decomposition of the water being a secondary result.

LXXIII. If in a row of the atoms of soda, extending from one electrode to the other, while forming the base of a sulphate, a series of electrolytic decompositions be induced from the cathode on the right, to the anode on the left, by which each atom of sodium in the row will be transferred from the atom of acid with which it was previously combined, to that next upon the right, causing an atom of the metal to be liberated at the cathode; this atom, deoxidising water, will account for the soda and hydrogen at the cathode. Meanwhile, the atom of sulphate on the left, which has been deprived of its sodium, must simultaneously have yielded to the anode the oxygen by which this metal was oxidised. Of course the acid is left in the hydrous state, usually called free, though more correctly esteemed to be that of a sulphate of water.

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* Communicated by the Author.

LXXIV. I cannot conceive how any other result could be expected from the electrolysis of the base of the sulphate of soda, than that which is here described. Should any additional illustration be requisite, it will be found in a note subjoined.*

LXXV. I will, in the next place, consider the phenomena observed by Professor Daniell, when solutions of potassa and sulphate of copper, separated by a membrane, were the medium of voltaic current.

LXXVI. Of these I here quote his own account.

"A small glass bell, with an aperture at

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* It is easy to understand how a simultaneous appearance of oxygen and acid at the anode, and soda and hydrogen at the cathode, may ensue, simply by the electrolysation of the alkaline base from the following association of formulæ.

Anhydrous sulphuric acid is represented by the usual formula, SO^3; oxygen by the usual symbol O; sodium by Na; water, acting as a solvent, by Ho. Each atom of oxygen, sodium, or acid, is numbered from right to left, 1, 2, 3, 4, so that the change of position consequent to electrolysis may be seen.

$$\begin{array}{lccccll}
 & 1 & 2 & 3 & 4 & \text{Water.} & \\
\text{Anode} & O & O & O & O & HO & \text{Cathode.} \\
 & & & & & & \\
 & \overbrace{Na}^{1} & \overbrace{Na}^{2} & \overbrace{Na}^{3} & \overbrace{Na}^{4} & & \\
 & & & & & & \\
 & \overbrace{SO^3}^{1} & \overbrace{SO^3}^{2} & \overbrace{SO^3}^{3} & \overbrace{SO^3}^{4} & & \\
 & HO & HO & HO & HO & &
\end{array}$$

$$\begin{array}{lccccccl}
 & 1 & 2 & 3 & 4 & & & \\
\textit{Anode} & O & O & O & O & O & H & \textit{Cathode.} \\
 & & & & & & & \\
 & & \overbrace{Na}^{1} & \overbrace{Na}^{2} & \overbrace{Na}^{3} & \overbrace{Na}^{4} & & \\
 & & & & & & & \\
 & SO^3 & \overbrace{SO^3}^{2} & \overbrace{SO^3}^{3} & \overbrace{SO^3}^{4} & & & \\
 & HO & HO & HO & HO & & &
\end{array}$$

As the atoms are situated in the second arrangement, the atom of oxygen (1), is at the anode, the atom of sodium, $\overbrace{Na}^{1}$, with which it had been united, having been transferred to the second atom of sulphuric acid, which had yielded its sodium to the third atom of acid, $\overbrace{SO^3}^{3}$, this having, in like manner, yielded its sodium to the fourth atom of acid, $\overbrace{SO^3}^{4}$, from which the fourth atom of sodium, $\overbrace{Na}^{4}$, had been abstracted by the electrolytic power. The atom of sodium thus removed from the fourth atom of acid, is represented in union with the oxygen of an atom of water of which the hydrogen, H, is at the cathode.

top, had its mouth closed by tying a piece of thin membrane over it. It was half filled with a dilute solution of caustic potassa, and suspended in a glass vessel containing a strong neutral solution of sulphate of copper, below the surface of which it just dipped. A platinum electrode, connected with the last zinc rod of a large constant battery of twenty cells, was placed in the solution of potassa; and another, connected with the copper of the first cell, was placed in the sulphate of copper immediately under the diaphragm which separated the two solutions. The circuit conducted very readily, and the action was very energetic. Hydrogen was given off at the platinode in a solution of potassa, and oxygen at the zincode in the sulphate of copper. A small quantity of gas was also seen to rise from the surface of the diaphragm. In about ten minutes the lower surface of the membrane was found beautifully coated with metallic copper, interspersed with oxide of copper of a black color, and hydrated oxide of copper of a light blue.

"The explanation of these phænomena is obvious. In the experimental cell we have two electrolytes separated by a membrane, through both of which the current must pass to complete its circuit. The sulphate of copper is resolved into its compound anion, sulphuric acid + oxygen (oxysulphion), and its simple cathion, copper: the oxygen of the former escapes at the zincode, but the copper on its passage to the platinode is stopped at the surface of the second electrolyte, which for the present we may regard as water improved in its conducting power by potassa. The metal here finds nothing by combining with which it can complete its course, but being forced to stop, yields up its charge to the hydrogen of the second electrolyte, which passes on to the platinode, and is evolved.

"The corresponding oxygen stops also at the diaphragm, giving up its charge to the anion of the sulphate of copper. The copper and oxygen thus meeting at the intermediate point, partly enter into combination, and form the black oxide; but from the rapidity of the action, there is no time for the whole to combine, and a portion of the copper remains in the metallic state, and a portion of the gaseous oxygen escapes. The precipitation of blue hydrated oxide doubtless arose from the mixing of a small portion of the two solutions."

LXXVII. It will be admitted, that agreeably to the admirable researches of Faraday, there are two modes in which a voltaic current may be transmitted, *conduction* and *electrolyzation*. In order that it may pass by the last mentioned process, there must be a row of anions and cathions forming a series of electrolytic atoms extending from the cathode to the anode. It is not necessary that these atoms should belong to the same fluid. A succession of atoms, whether homogeneous, or of two kinds, will answer, provided either be susceptible of electrolyzation. Both of the liquids resorted to by Daniell, contained atoms susceptible of being electrolyzed. If his idea of the composition of sulphate of copper, and the part performed by the potassa, were admitted for the purpose of illustration, we should, on one side of the membrane, have a row of atoms consisting of oxysulphion and copper; on the other, of oxygen and hydrogen.

LXXVIII. Recurring to Daniell's own description of the electrolyzing process, above quoted, an atom of copper near the anode being liberated from its anion, oxysulphion, and charged with electricity, seizes the next atom of oxysulphion, displacing and charging an atom of copper therewith united. The cupreous atom thus charged and displaced, seizes a third atom of oxysulphion, subjecting the copper, united with it, to the same treatment as it had itself previously met with. This process being repeated by a succession of similar decompositions and recompositions, an electrified atom of copper is evolved at the membrane, where there is no atom of oxysulphion. Were there *no other anion* to receive the copper, evidently the electrolyzation would not have taken place; but oxygen, on the one side of the membrane, must succeed to the office performed by oxysulyhion on the other side; while hydrogen, in like manner, must succeed to the office of the copper.

LXXIX. Such being the inevitable conditions of the process, how can it be correctly alleged by Professor Daniell, the transfer of the copper being arrested at the membrane, that as this metal "*can find nothing to combine with*," it gives up its electrical charge to the hydrogen, which proceeds to the cathode? As hydrogen cannot be present, excepting as an ingredient in water, how can it be said that the copper can discharge itself upon the hydrogen, without combining with the oxygen necessarily liberated at the same time by the electrolytic process? How could the copper, in discharging itself to a cathion, escape a simultaneous seizure by an anion? Would not the oxidizement of this metal be a step indispensable to the propagation of that electrolytic process, by which alone the hydrogen could, as alleged, "*pass to the platinode?*" i. e. cathode?

LXXX. In these strictures I am fully justified by the following allegations of Faraday, which I quote from his Researches, 826, 828 :—

"A single ion, i. e. one not in combination with another, will have no tendency to pass to either of the electrodes, and will be perfectly indifferent to the passing current, unless it be itself a compound of more elementary ions, and so subject to actual decomposition.

"If, therefore, an ion pass towards one of the electrodes, another ion must also be passing simultaneously to the other electrode, although, from secondary action, it may not make its appearance."

LXXXI. In explanation of the mixed precipitates produced upon the membrane, I suggest that the hydrated oxide resulted from chemical reaction between the alkali and acid, the oxide from the oxygen of the water of potassa acting as a cathion in place of that of the oxide of copper: also that the metallic copper is to be attributed to the solutions acting both as conductors and as electrolytes; so that, at the membrane, two feeble electrodes were formed, which enabled a portion of the copper to be discharged without combining with an anion, and a portion of oxygen to be discharged without uniting with a cathion. In this explanation I am supported by the author's account of a well known experiment by Faraday, in which a solution of magnesia and water was made to act as electrodes at their surfaces respectively.

LXXXII. There can, I think, be no better proof that no reliance should be placed on the experiments with membranes, in this and other cases where the existence of compound radicals in acids is to be tested, than the error into which an investigator so sagacious as my friend Professor Daniell has been led, in explaining the complicated results.

LXXXIII. The association of two electrolytes, and the chemical reaction between the potassa and acid, which is admitted to have evolved the hydrated oxide, seem rather to have created difficulties than to have removed them.

LXXXIV. In this view of the subject, I am supported by the opinion of Faraday, as expressed in the following language :—

"When other metallic solutions are used, containing, for instance, peroxides, as that of copper combined with this or any decomposable acid, still more complicated results will be obtained, which, viewed as the direct results of electro-chemical action, will, in their proportions, present nothing but confusion; but will appear perfectly harmonious and simple, if they be considered as secondary results, and will accord in their proportions with the oxygen and hydrogen evolved from water by the action of a definite quantity of electricity."

LXXXV. I cannot conceive, that in any point of view the complicated and "*confused*" results of the experiment of Daniell with electrolytes separated by membranes, are rendered more intelligible by supposing the existence of salt radicals. I cannot perceive that the idea that the anion in the sulphate is oxysulphion, makes the explanation more satisfactory than if we suppose it to be oxygen. Were a solution of copper subjected to electrolysis alone, if the oxide of copper were the primary object of the current, the result would be analogous to the case of sodium, excepting that the metal evolved at the cathode, not decomposing water, would appear in the metallic form. If water be the primary object of attack, the evolution of copper would be a secondary effect.

LXXXVI. It is remarkable, that after I had written the preceding interpretation of Daniell's experiments, I met with the following deductions stated by Matteuchi, as the result of an arduous series of experiments, without any reference to those of Daniell above mentioned. It will be perceived that these deductions coincide perfectly with mine.

LXXXVII. I subjoin a literal translation of the language of Matteuchi from the Annales de Chimie et de Physique, tome 74, 1840, page 110 :—

"When salt, dissolved in water, is decomposed by the voltaic current, if the action of the current be confined to the salt, for each equivalent of water decomposed in the voltameter, there will be an equivalent of metal at the negative pole, and an equivalent of acid, plus an equivalent of oxygen, at the positive pole. The metal separated at the negative pole will be in the metallic state, or oxidised according to its nature. If oxidised, an equivalent of hydrogen will be simultaneously disengaged by the chemical decomposition of water."

LXXXVIII. Thus it seems, that the appearance of acid and oxygen at the anode, and of alkali and hydrogen at the cathode, which has been considered as requiring the simultaneous decomposition of two electrolytes upon the heretofore received theory of salts has, by Matteuchi, been found to be a result requiring the electrolysis of the metallic base only, and, consequently, to be perfectly reconcileable with that theory.

LXXXIX. In fact I had, from the study of Faraday's Researches, taken up the impression, that the separate appearance of an acid and base, previously forming a salt, at the voltaic electrodes, was to be viewed as a secondary effect of the decomposition of the water or the base; so that acids and bases were never the direct objects of electrolytic transfer.

OF LIEBIG'S "PRINCIPLES," SO CALLED.

XC. Under the head of the "theory of organic acids," in Liebig's Treatise on Organic Chemistry, we find the following allegations dignified by the name of principles. Manifestly they must tend to convey a false impression to the student, that hydrogen has a peculiar property of creating a capacity for saturation, instead of being only the measure of that capacity, as is actually true, and likewise that in this respect it differs from any other radical.

XCI. The allegations to which I refer are as follows, being a literal translation from the French copy of the Traité of Liebig, page 7:—

"The hydrated acids are combinations of one or more elements with hydrogen, in which the latter may be replaced wholly or in part by equivalents of metals.

"The capacity of saturation depends consequently on the quantity of hydrogen which can be replaced.

"The compound formed by the other elements being considered as a radical, it is evident that the composition of this radical can exercise no influence on the capacity of saturation.

"The capacity of saturation of these acids augments or diminishes in the same ratio as the quantity of hydrogen, not entering into the salt radical, augments or diminishes.

"If into the composition of the salt radical there should be introduced an undetermined quantity of any elements, without changing the quantity of hydrogen extraneous to the radical, the atomic weight of the acid would be augmented, but the capacity of saturation would remain the same."

XCII. As by the advocates of the existence of "*salt radicals*," hydrogen is considered as playing the part of a metallic radical, and must, therefore, as respects any relation between it and the capacity of saturation, be in the same predicament as any other electro-positive radical, I cannot conceive wherefore laws, which affect every other body of this kind, should be stated as if particularly associated with hydrogen.*

XCIII. Would not a more apprehensive and correct idea be presented by the following language?—

XCIV. From any combination of an acid with a base, either the base or its radical may be replaced by any other radical or base, between which and the other elements present, there is a higher affinity. Of course from acids called hydrated, from their holding an atom of basic water, either this base, or its radical (hydrogen), may be replaced by any other competent base or radical.

XCV. The premises being manifestly fallacious, still more so is the subsequent allegation, that in consequence of the hydrated acids being compounds formed with hydrogen, their capacity of saturation *depends* on the quantity of this element which can be replaced.

XCVI. Is not this an inversion of the obvious truth, that the quantity of hydrogen present is as the capacity of saturation; and that, of course, the quantity of any element which can be substituted for it must be in equivalent proportion? Would not a student, from this, take up two erroneous ideas—first, that the capacity of saturation is conferred by the radical, and, in the next place, that of all radicals hydrogen alone can give such a capacity? Is it not plain, that the assertion here made by the celebrated author would be true of any radical?

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* There is, in some respects, a coincidence so remarkable as to the part taken by Dr. Kane and myself, with respect to hydrogen, that I quote here the language which has been held by us respectively on this subject.

Treating of hydrogen, Dr. Kane uses the following words:—"It was at one time supposed that it shared with oxygen the power of generating acids; and as sulphur, chlorine, iodine, cyanogen, &c., formed one class by combining with oxygen, so they formed a second class, called hydracids, by entering into union with hydrogen. * * * In the year 1832 I proved this view to be incorrect, that all the properties of the compounds of hydrogen combined to show that it was an eminently electro-positive body, that it took place along with iron, manganese, and zinc. * * * * These views have been still farther corroborated by the researches of Graham." * * * * There rests, now, no doubt in the minds of philosophical chemists, that hydrogen is a metal enormously volatile."

This justifies the following language held in my letter on the Berzelian nomenclature.

"I am of opinion that the employment of the word hydracid, as co-ordinate with oxacid, must tend to convey the erroneous idea, which, in opposition to his own definition, the author seems to have been imbued, that hydrogen in the one class plays the same part as oxygen in the other. But, in reality, the former is eminently a combustible, and of course the radical, by his own definition."

So entirely have I concurred in considering hydrogen as an aëriform metal, that, for more than twenty years, I have, in my lectures, accounted for the amalgamation of mercury when electrolysed in contact with sal ammoniac, by inferring ammonia to be a gaseous alloy of two metallic ingredients, hydrogen and nitrogen being both aëriform metals.

XCVII. Passing over a sentence which has no bearing on the topic under discussion, in the fourth allegation we have a reiteration and expansion of the error of those by which it is preceded. We are informed that the "*capacity of saturation augments and diminishes with the quantity of hydrogen which can be replaced*," which is again an inversion of the truth, that the quantity of hydrogen varying with the capacity, the quantity of any other radical, competent to replace it, must be in equivalent proportion.

XCVIII. Is not the concluding allegation a mere truism, by which we are informed, "that if any undetermined quantity of any element should be introduced into the composition of the radical, without changing the capacity (as measured by hydrogen), the capacity would be found the same when measured by any other radical?"

XCIX. As all that is thus ascribed to hydrogen must be equally true of any other radical, there would have been less liability to misapprehension, had the generic term radical been employed wherever hydrogen is mentioned. But by employing the word radical to designate halogen elements, the advocates of the existence of compound radicals in amphide salts have deprived the word in question of much of its discriminating efficacy. In fact, their nomenclature would confound all ultimate elements under one generic appellation, and all their binary combinations under another; so that almost every chemical reagent, whether simple or compound, would be a salt or a radical.

C. Before concluding, I feel it to be due to the celebrated German chemist abovementioned, to add, that however I may differ from him as to the acids being hydrurets of compound radicals, I am fully disposed to make acknowledgments for the light thrown by his analytical researches on organic chemistry, and the successful effect of his ingenious theoretic speculations, in rendering that science more an object of study with physicians and agriculturists.

ON THE ERRORS OF MODERN CHEMISTS.

To the Editors of The Chemist.

Gentlemen,—

Were it not for the deep conviction that the honors of that learned body—the British Association—are inaccessible to the humble in station or talents, I should reserve the following important discovery of a general law in chemical science until the sitting of 1844. Upon its own merits, however, I now commit it to the public.

ON THE HEAT OF COMBINATION.

BY DR. ANDREWS.

Read before the British Association.

The object of this communication was to announce the following general principle as a consequence of previous researches of the author on the same subject, and to give a general account of some recent experiments which appear to him to establish its accuracy.

The law may be stated as follows:—

"When one *base* displaces another from any of its neutral combinations, the heat evolved or abstracted is always the same when the *base* is the same, or, in other words, the change of temperature which occurs during the substitution of one *base* for another in any neutral compound *depends wholly on the bases*, and *is in no respect influenced* by the *acid* element of the combination."

To test the accuracy of this principle by

ON THE HEAT OF COMBINATION.

BY S. E. PHILLIPS.

The object of this communication is to announce the following general principle as a consequence of previous researches of the author on the subject, and to give a general account of recent experiments which appear to establish its accuracy.

The law may be stated as follows:—

"When one *acid* displaces another from any of its neutral combinations, the heat evolved or abstracted is always the same when the *acid* is the same, or, in other words, the change of temperature which occurs during the substitution of one *acid* for another in any neutral compound *depends wholly on the acids*, and *is in no respect influenced* by the *basic* element of the combination."

To test the accuracy of this principle by direct experiment, equivalent solutions of various salts were decomposed by the addition of a dilute solution of hydrate of potassa. When the strength of the solutions and their temperatures were properly adjusted, the same variation of temperature always occurred during the decomposition of salts of the same base. If the base (in the state of hydrate) developed when alone less heat than the hydrate of potassa in combining with acids, an elevation of temperature occurred during the decomposition of its salts by the latter; if the reverse were the case, the decomposition of the salts was accompanied by a diminution of temperature.

Thus the decomposition of equivalent solutions of the salts of oxide of zinc was attended by the evolution of the same amount of heat, as was also the decomposition of the salts of the oxide of zinc; but the heat extricated by the former was about twice as great as that extricated by the latter, because the oxide of copper produces less heat in combining with the acids than the oxide of zinc.

direct experiment, equivalent solutions of various salts may be decomposed by the addition of a dilute solution of hydrated sulphuric acid. When the strength of the solutions and their temperatures are properly adjusted, the same variation of temperature always occurs during the decomposition of salts of the same acid. If the acid (in the state of hydrate) developed when alone less heat than the hydrated sulphuric acid in combining with bases, an elevation of temperature will occur during the decomposition of its salts by the latter; if the reverse be the case, the decomposition of the salts will be accompanied by a diminution of temperature.

Thus the decomposition of equivalent solutions of the salts of *cobaltic acid* will be attended by the evolution of the same amount of heat, as will also the decomposition of the salts of chromic acid; but the heat extricated by the former will be about twice as great as that extricated by the latter, because the oxide of cobalt produces less heat in combining with the bases than the oxide of chrome (or chromic acid).

Although the above was written with scarcely a moment's premeditation, and without any consultation whatever of chemical authorities, yet I venture to predict its relative truth.

In the prevailing ambiguously learned language of modern chemical philosophers, both sides of this ridiculous problem are equally true; but in the simple language of common sense and ordinary ratiocination they both unitedly contain but a feeble illustration of more general and ultimate laws, whose discovery I claim, and which were submitted to the Royal Society two years ago, and rejected by that learned body.

Feeling my incompetency, from want of means, to consult the necessary authorities, I have, at different periods, used the most strenuous exertions to obtain either the patronage or assistance of the most eminent chemists, not omitting some institutions whose professed object, like that of the Royal Society, is to encourage the development of scientific truth. The most discouraging and complete failure has attended all; and this challenge to prevailing chemical philosophy would not have now been given, but for the circumstance that in addition to many recent discoveries (most plainly involved in my previous indications, some of which have been made partially public), a most vigorous attack on some modern and popular views is being made by Dr. R. Hare, Professor of Chemistry in the University of Pennsylvania.

The American professor appears keenly to perceive the incongruities involved in the various hypotheses of our leading British and Continental chemists, but lays no claim to the recognition of any first principles of molecular forces, by which alone the science can now be estimated and popularly understood, and the nomenclature rendered uniform, and simple even to the commonest intellect.

The professor aptly describes Liebig's principles involved in his theory of organic acids as "mainly an inversion of truth," and justly argues that "all which is truly said of hydrogen would be equally true of other radicals."

In the same strain, I conclude with two quotations, from papers which (should this introductory letter be favorably received), will be quite at the service of your improving periodical.

"It appears to the author a most unfortunate circumstance for the progress of the science that such confused and mistaken views of *hydrogen* have prevailed; even in the most recent works, the student is ever being checked in his progress by these inexplicable phrases — *hydrosalts*, *hydracids*, *hydrates*, &c.—phrases indicative of no one single principle of nomenclature or law of combination."

Behold the enlightened definition from Turner's Chemistry!—

"This order (hydrosalts) includes no salt, the acid or base of which does not contain hydrogen."

Surely this is too ridiculous to need exposure; for how many oxy, sulpho, chloro, and other salts, contain hydrogen either in their negative or positive ingredients? Besides, on what principle is hydrogen selected from the several constituents of these numerous salts?

As we have oxysalts, sulphosalts, &c., &c., so, on the same principle, we have oxyacids, sulphacids, chloracids, and many others, so named, and very correctly, from their negative or ACIDIFYING ingredient; but what is a young student to understand by the term hydracid? *There exists no such anomaly as an hydracid.*

"That the most confused and vague ideas are entertained respecting this hydrogen of the hydracid is further evident by a reference to the chapter 'On the Theory of Organic Acids.' These peculiarities we have investigated under the head of 'The Capacity of Saturation;' that which more immediately concerns us now, is that view of the hydracids which involves the constitution of the entire class of saltic bodies."

(From paper on the Saltic Constitution.)

"The assertion (of Liebig) that 'the capacity of saturation' is dependent on that of the hydrogen of an hydrated acid, and that this property is independent of the constitution of the radical," is another singular instance of confusion and perplexity on this subject.

We assert that *it is the constitution of the radical*, and *that alone*, which determines the quantity of hydrogen which shall be saturated, and all the phenomena in question. If this property be dependent on the hydrogen of the hydrated acids, then does it follow that the anhydrous acids have no capacity of saturation? Or on what does the saturation of sulphuric acid depend, in its most perfect saltic type—$KO + SO^3$? Besides, how is it that this property is dependent on that which is capable of replacement, and in cases of basic substitution leaves the compound? Might it not with equal propriety be said to depend on the sodium, magnesium, &c., &c.?

The following is another curious specimen of this kind of writing:—

"If into the composition of the radical there enters any indeterminate quantity of whatever elements without the quantity of hydrogen, apart from the radical being changed, the atomic weight of the acid will augment, but its capacity of saturation will remain the same, &c." There is this difference between this singular treatment of the subject and that which we have reviewed from the "Traite de Chimie" of Berzelius: that whereas the assertions of the latter are manifestly untrue—those of the former are the more perplexing, as they so nearly approximate the truth, involving, however, principles so isolated and confusing, or rather no principles at all, but such an ambiguous expression of simple truths as almost baffles the powers of ordinary comprehension.

After stating that the radical or reunion of the other elements as apart from the hydrogen of replacement exercises no influence whatever on the capacity of saturation, the 2nd general law is enunciated as follows:—"When, therefore, the quantity of hydrogen in combination with the radical is increased or diminished, the capacity of saturation will suffer a proportionate increase or diminution."

And can it be supposed that hydrogen possesses any isolated *or mysterious power of augmenting or diminishing itself* without any reference to the different radicals or bodies which may unite with its several ratios?!!! Is it not palpably manifest that the differing quantities of hydrogen are determined wholly and solely by the saturating powers of its different uniting bodies? Why is it that hydrogen unites with protinic energy (or in the ratio of 1 to 1 with oxygen, and with terinic energy, or in the ratio of 1 to 3) with nitrogen?

Have the different capacities of saturation here involved "no relation whatever" to the distinctive differences of oxygen and nitrogen, whose different position in the electro series determines their different inic unions and all their different reactions?

We might as well be told that the oxides or oxacids are certain compounds of oxygen with one or more elements where oxygen may be replaced with other bodies.—See Law I.

That the capacity of saturation of these acids augments or diminishes as the oxygen in combination is increased or diminished, &c.—See Laws II. and III.

Therefore the "radicals or other elements can have no influence whatever on the capacity of saturation"!!!

That, if into the composition of the radical or other elements, there enters any quantity of whatever elements without the quantity of oxygen apart from these unions being changed, the atomic weight of the acid will be augmented, but its capacity of saturation will remain the same.—See Law III.

Or we might be told—the analogy being yet more true—that the cyanogen acids are certain compounds of cyanogen with one or more elements where cyanogen may be replaced by other bodies.—Law I.

That the capacity of saturation of these bodies augments or diminishes as the cyanogen in combination is increased or diminished.—Law II.

And therefore the radical or other elements can have no influence whatever on the capacity of saturation ! ! !

That if into the composition of this radical or other elements, there enters any quantity of whatever elements without the quantity of cyanogen apart from these unions being changed, the atomic weight of the acid will augment, but its capacity of saturation will remain the same.—Law III.

We know that both hydrogen and cyanogen, when their primitive combining energy is saturated with oxygen and sulphur, form idic bodies of relatively high powers of saturation, neutralizing KO and KS to the formation of oxhydrates and sulphydrates $KO + HO$ and $KS + HS$, and sulpho cyanates $KO + CyO$ and $KS + CyS$.

Moreover, when nitrogen is united with cyanogen or hydrogen, the compounds present a very different capacity of saturation, and are incapable of the saltic constitution. This phenomenon, involved in the constitution of ammonia, as related to other hydrocombinations, is fully involved, and simply explained in our view of the subject; but the above so called "general laws" are altogether inadequate to explain the difference.

If, by the term "hydrate of an acid is meant, for the future, combinations of 1, 2, or 3 eqs. of hydrogen with certain other elements, which, being considered as combined with each other, constitute the radical of the acid" (Liebig), then the term "potassuret of an acid" must also mean for the future a combination of 1, 2, or 3 elements of potassium, with certain other elements, which being considered as combined together, constitute the radical of the acid ! ! !

Hydrated sulphuric acid would be $SO^4 + H$
Sulphate of potassa would be $SO^4 + K$
So that of the latter, that is, the "potassiuret of the acid," the negative or acidifying elements, S and 4O "being considered as combined with each other," constitute not the acid ! ! but only the radical of the acid ! ! ! !

(From Paper on the Capacity of Saturation of Chemical Bodies generally.)

I remain,
Gentlemen,
Respectfully yours,
S. E. Phillips.

Theberton Street, Islington.

ON THE PRESENCE OF A FATTY SUBSTANCE IN BEER.*

BY DR. VOGEL, JUN., OF MUNICH.

Beer is, as is known, of the number of the alimentary substances which exert a decisive influence on the formation of fat. However, we were not hitherto acquainted with the existence of a fatty matter in this drink; Dr. Vogel, jun., therefore, thought that some investigations on this subject might assist in solving the important question of the origin of fat in the body of animals.

Beer leaves, by slow evaporation, a brown, viscous residue. This was dried at 212° F., in a sand-bath, and reduced to a fine powder. Treated several times by boiling ether, this brown substance yields to ether a yellow, oily, fatty matter, of a peculiar odor, similar to that of malt, and which remains under the form of drops, after the evaporation of the ether. This fatty matter forms, with the alkalis, soluble soaps, and leaves a greasy stain on paper.

With regard to the quantity of this fatty matter in beer, three concordant experiments have shown that 100 parts of extract of beer contain 0·1605 of principles soluble in ether.

Now, as beer contains so small a quantity of these principles, and as, moreover, the observation of physicians has put beyond doubt the influence of this alimentary drink on the formation of fat, Dr. Vogel concludes that this action should necessarily be attributed to the decomposition of the other principles of beer, and that his work furnishes a new proof in favor of Professor Liebig's theory of the formation of fat.

ON A NEW PROCESS FOR PREPARING IODIC ACID.

BY J. L. LASSAIGNE.

Several processes for the preparation of iodic acid have already been published, but most of them require a long time; that which we have lately put in practice is so simple, and presents so few difficulties in its execution, that we think it will soon be preferred in a great number of cases.

It is known that chlorine and iodine in solution in water decompose the solution of nitrate of silver, converting it into insoluble chloride or iodide of silver, themselves passing partly to the state of chloric or iodic acid, which remain in the solution mixed with the nitric acid liberated. This reaction, which takes place at the ordinary temperature, when we operate with aqueous solutions of these metalloïds, is also produced by means of an elevation of temperature without these compounds being destroyed. This circumstance has permitted us to obtain iodic acid by the evaporation to dryness of the acid liquid, in the midst of which the iodide of silver is formed. Theory indicates, indeed, that 12 atoms of iodine should decompose 5 atoms of nitrate of silver, and that there results from this reaction 5 atoms of insoluble iodide of silver, and one atom of iodic acid, as represented by the following equation:—

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* *Annalen der Chemie und Pharmacie.*

$$I^{12} + 5AgO, N^2O^5 = I^{10}Ag^5, + I^2O^5 + NO^5.$$

By reacting on a solution of nitrate of silver, in a glass phial, with the aid of heat, with pulverized iodine in such proportion that the latter may be in slight excess, a great quantity of iodide of silver is obtained which may easily be separated by filtration, and an acid liquid containing the iodic acid, and all the nitric acid which was combined with the oxide of silver. This liquid, colored of a faint amber yellow, by the excess of iodine employed, evaporated to dryness in a porcelain capsule, in order to drive off the whole of the nitric acid, leaves a white, granular mass of pure iodic acid, deliquescent in the air, moist, and entirely soluble in distilled water.

This same process, tried for the preparation of bromic acid, by treating a solution of nitrate of silver by an excess of bromine, was not successful. The want of success, was, perhaps, due to the decomposition of the bromic acid by heat; for it was observed, that, during the evaporation, rutilant vapors were disengaged from the liquid mass.

It yet remains to try the application of this process to the preparation of chloric acid isomeric with iodic acid: this will be done on the first opportunity.

THE EFFECT OF COLORED DEVICES OF CHINA WARE ON THE CRASSAMENTUM OF THE BLOOD.*

BY P. J. MURPHY, M.D.

(Concluded from page 436.)

FIRST EXPERIMENT.

Blood was received into a tea cup, colored blue by cobalt; the figured devices, neither to the touch nor to the microscope, appeared raised. On inverting the crassamentum, no impression had taken place.

SECOND EXPERIMENT.

A tea cup, with figures evidently raised, ascertained by drawing over them the finger slightly moistened, and colored by protoxide of chrome and manganese was next used. Both the colored figures gave impressions in every way similar to each other.

THIRD EXPERIMENT.

Two vessels with raised figures—one colored by cobalt, and the other by copper—gave impressions in every respect similar to each other, and to those of chrome and manganese.

These experiments prove that impressions are given by four metals, provided the figures are raised, *i. e.*, by chrome, manganese, cobalt, and copper; while, if the figure be not raised as in the first experiment, no impression is received from cobalt.

FOURTH EXPERIMENT.

Some figures were painted with the hydrated arseniate of copper, and then varnished: they produced no impression.

FIFTH AND SIXTH EXPERIMENTS.

The di-chromate of lead and the oxide of chrome were next employed; the former gave a very evident impression, but the latter scarcely any. It is necessary to varnish these colors or otherwise they will *run.*

SEVENTH EXPERIMENT.

The next experiment was made with medals. Four were employed, and in every case the indentation was deep and the color vivid.

This last experiment decided the question as to its mechanical and chemical effect. The phenomenon appears to be an optical illusion, such as we constantly witness in viewing any of the colored crystallized salts. The red prussiate of potassa is an excellent example. As arguments in favor of its mechanical origin, it will be found that the impression will be deeper if the blood be inflamed, as the crassamentum then sinks more rapidly to the bottom of the vessel, or the more the blood abounds in crassamentum, or if the column of blood be high, or if the clot should adhere more to the sides of the vessel, and thus allow the serum to intervene between the clot and the bottom of the cup, no impression can take place; but if the serum be drawn off with a syringe the clot then comes in contact with this figure and the impression is received. Mr. Muspratt obtained the opinions of two of the most eminent chemists in the United Kingdom, which coincided with his own, that the phenomenon is mechanical.

As a curious fact in the science of optics he showed me a worsted rug worked by a lady. The colors were partly a red ground and partly a green, and in the centre were worked flowers of the same colors, but different from the ground work; on the slightest agitation the flowers seemed to move up and down, and so deceptive was this appearance that it required a close examination to be convinced that this motion did not take place in reality.

The proportion of metal used in coloring glass is so small that one could hardly suppose that it could produce any chemical effect: one thousand grains of glass are highly colored by one grain of cobalt.

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* Communicated to The Chemist.

The colors used in china ware and glass are so well known that they need not be here detailed; but lately chrome has been introduced very extensively.

If the effect be chemical, it could be produced only on the hematosine, the composition of which, according to Mulder's analysis is as follows:—

Formula.	
Carbon ..	44
Hydrogen	22
Nitrogen	3
Oxygen..	6
Iron	1

Many chemists state that the iron exists in the state of an oxide, but from Mulder's analysis (the most plausible) it is an integral part of the constitution, and becomes gradually a peroxide on exposure to the air. The composition of the peroxide of iron is $Fe^2 O^3$.

NEW MEANS OF PREPARING NITROUS ETHER.*

BY M. PEDRONI.

CHANCE has led me to a new mode of preparing nitrous ether (nitrite of oxide of ethule). Having poured a residue of alcoholized and boiling sulphuric ether into a flask containing crystallized nitrate of ammonia, a reaction was immediately produced, and I recognised the odor of nitrous ether. I have several times repeated the experiment, and I have always succeeded. The following are the proportions which I employ:—

11 parts of crystallized nitrate of ammonia.
8 ,, of sulphuric acid.
9 ,, of alcohol.

The alcohol and the sulphuric acid are mixed and poured on the salt; it is distilled over the bare fire, as in the distillation of of water; sulphate of ammonia is formed: the nitric acid in the nascent state combines with the alcohol, forming nitrite of oxide of ethule, aldehyd, and water. The following is the formula of the reaction:—

$$(N^2 H^6 + N^2 O^5 + H^2 O) + SO^3 + 2 C^4 H^{12} O^2 = (SO^2 + N^2 H^6 + H^4 O^2) + (C^4 H^6 O + H^2 O) + (C^1 H^{10} O + N^2 O^3.)$$

In the preparation of nitrous ether by alcohol and nitric acid, we can operate only on a small quantity of mixture, on account of the almost instantaneous production of ether; here, on the contrary, the operation proceeds regularly, and without any danger.

II. CHEMICAL MANUFACTURES AND AGRICULTURAL CHEMISTRY.

REPORT OF THE SELECT COMMITTEE ON SMOKE PREVENTION.

JULY AND AUGUST, 1843.

IN continuation of our brief notice of last month, we find, after a careful perusal of this voluminous report (for the minutes comprise 195 folios), that we shall not have much new matter to add, unless, indeed, we were to enter on mechanical details, which would only be wearisome to many of our readers. Nevertheless, we recommend the report as a valuable record of what is known and practised to burn, or prevent smoke from being emitted where coal is burnt in engine furnaces.

The only members examined were William Beckett, Esq., M.P., and G. F. Muntz, Esq., M.P. The honorable member for Leeds stated what had been done in Yorkshire to abate the nuisance, with some success; while the honorable member for Birmingham gave evidence of a more practical bearing; admitting the general principle of dividing the air to obtain it in the form of jets in the furnace, he preferred increase of boiler-room, which, any one may see would not reach the majority of cases, the moving and enlarging of boilers being a work of time and great expense.

The professional gentlemen examined were in the order of Dr. Ure, Dr. Reid, Mr. W. West, Dr. Arnott, Mr. E. Solly, Mr. E. O. Manby, C.E., Mr. J. Parkes, C.E., Professors Brande and Faraday.

They all confirmed the necessity of admitting air to furnaces, and recommended its admission in the divided form of jets or films. Mr. West, of Leeds, who has seemingly been much busied in this inquiry in

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[*] *Comptes Rendus*, No. 15, Oct. 9, 1843.

Yorkshire, made some extraordinary prevaricating statements which Dr. Ure exposes pages 184-5) very satisfactorily. Mr. Solly, of the Royal Institution, entered more fully, and ably into the chemical investigation of the subject than any of the other witnesses. Dr. Reid's attention was a good deal called to ventilation and to the combustion of coke for house fires. Mr. Brande, Mr. Faraday, and Dr. Arnott, were each excellent in all they said, but no new feature presents itself for special notice. Mr. Josiah Parkes' evidence is exceedingly interesting; it evinces great practical experience, and a masterly handling of this intricate subject—intricate, however, only when considered in all its various relations—the varieties of engines, boilers, furnaces, fuel, work to be done—and, patents *to do everything*.

Then follow the patentees and others: to take them in order, we must commence with Mr. John Chanter; but such a jumble we never read, and it is a wonder that the Committee submitted to the substitution of anything but direct replies to their queries. The obvious reason, as it appears to us, for all this evasion while under examination could only have been his sense of having no satisfactory meritorious plan of his own, unless, indeed, an imitation of Mr. C. Williams's Argand furnace deserves the name of originality!

Mr. Joseph Smith, of Bradford, first advanced to pioneer the way for his friend Mr. Billingsley, probably from his better gift of loquacity. He first, and Mr. Billingsley afterwards, acknowledged that the plan of furnace they recommended was so like the Argand furnace, that there was no difference!

"505. Then why (said Mr. Brotherton) do you adopt the plan of having a *number* of apertures instead of *one?*"

"*Merely*," replied Mr. Smith, "*for the niceness of the arrangement—that is all.*"

Mr. Godson described a grate to rise and fall in the centre of the common grate, to be used on the system of slow combustion, but he only spoke to one being tried. It was stated to be inapplicable for marine boilers.

Mr. Charles Wye Williams, managing director of the Dublin Steam Packet Company, and patentee of the Argand furnace, gave a very lucid and truly scientific view of the combustion of fuel and its gaseous products; and which we in our October and November numbers more fully examined than our present limits will permit. Mr. H. Dircks gave evidence on the same subject, explaining the working and management of the Argand furnace.

Mr. C. Goodall, of Camden-town, and Mr. J. Dewrance, engineer, Liverpool and Manchester Railway, detailed the practical results obtained by their using the Argand furnace, as did also Mr. H. Houldsworth, cotton spinner, Manchester.

Mr. J. Juckes, who, we are informed, is an English farmer, but whom we had mistaken for a German Jew, or a follower of Johanna Southcote, from the length of his hair and beard, is the patentee of a grate consisting of an endless chain of bars, moving on rollers, placed at back and front. This plan, of which Mr. Christie spoke favorably, appears to us very expensive and entirely mechanical, without any provision to burn the gases generated; indeed, this witness says (764), "I think, from what *little experience* I have had, that what air enters the fire ought to enter through the fire bars." This is very well for the solid fuel, which is all these men of "little experience" think they have to encounter. Let him, or any sane man, look at the engraved diagrams of pyrometoic temperature, furnished by Mr. Houldsworth in the report, and then say whether the gas requires not more atmospherical oxygen than it can obtain from what air arrives at the surface of the fuel, *after* entering "through the fire bars."

Mr. G. Haynes, who had tried this grate, says, (1597), "it did not keep up the steam sufficiently."

Mr. T. Hidley, of Newcastle, described his patent of a series of upright shafts, with a shower of water on the top of every other shaft, or chimney. This is precisely the plan of Jeffrey, of Bristol, whose patent some time since expired. It was approved by Mr. J. Hunt.

Mr. Bell, of Edinburgh, spoke of Ivison's patent; a jet of steam injected into the furnace fire, but which, for the little effect due to it, merely acts as a blower to take in additional air.

Captain Sir W. E. Parry, R.N., stated that a plan by Mr. Joseph Williams, of Liverpool, had been tried in the "Urgent," the "Merlin," the "Driver," and the "Shearwater," but discontinued in all these steamers, the apparatus being to heat the air, and getting "completely burnt out." (Page 110.)

Of the remainder of the evidence we can only briefly observe, that Dr. Molesworth, Vicar of Rochdale, spoke exceedingly well and to the purpose; a Mr. A. Booth, a reporter, assumes to know a great deal, Mr. Charles Hood, F.R.A.S., and something more, has raked up a long catalogue of inanimate rubbish, to regale and astonish the committee with his musty gatherings. Mr. Thomas Lloyd, of the Dockyards, Woolwich, detailed experiments made there with fuels and furnaces. Captain Sleigh gave a statement of smoke nuisance at Manchester; Mr. J. M. Crick, "head brewer in Meux's brewery," appears never to have troubled his own head with anything past the mashtub; his evidence caused some amusement. Mr. Vickery begged to recommend Anthracite as a panacea for smoke nuisance; and, lastly, Mr. Leighton, an engineer, described Keymer's patent Anthracite burning grate.

We really think, after poring over this mass of evidence, that if it were fairly sifted of extraneous matter, little more would remain than a small portion of the professional part intermingled with the practical observations of such men as Mr. Parkes, Mr. Houldsworth, Mr. C. W. Williams, and Mr. Dewrance, in whose evidence there is found something sterling and substantial, without anything of creeping, cringing, and evasion, and free from the blindness displayed by others, where the really philosophical and practical bearing of the subject are attempted to be blended.

We have long been in darkness as to the best practical medical method of preventing smoke; and certainly to Mr. Williams must be awarded the merit of having pointed out the best method, and his Argand furnace will, we doubt not, prove a lasting monument of his persevering ingenuity, and his scientific and practical skill.

SUMMARY OF THE OFFICIAL REPORT ON GAS ILLUMINATION, PRESENTED BY THE COMMISSION OF TOULON.

FROM OUR OWN CORRESPONDENT.

The experiments hitherto made have related to the mode of lighting called *Sideral Gas*, which consists in burning ether by means of a current of oxygen. The gas, previously prepared, was brought on board of several boats in metallic receivers, wherein it was under a pressure of several atmospheres. Over each receiver was screwed a box of the capacity of about a pint, containing ether, which the oxygen had to traverse, when disengaged. A regulator, on Boquillon's system, was joined to the receiver, in order to give uniformity to the jet of oxygen, and, consequently, to the flame. The pressure was indicated by a manometer. A red copper reflector, plated with silver, and of the parabolic form, was adapted to the beak of gauze, and might be turned in every direction by means of pulley-pieces. In the focus of this reflector burned the mixture of oxygen and vapor of ether; a piece of lime of the size of a pea, and retained by a platinum wire, was fixed to the focus. Magnesia is most frequently employed instead of lime.

In very fine weather, on the 14th July, between 9 and 10 p.m.—the stars and moon shining—the focus placed on the steam-boat Le Ténare, projected so brilliant a light on all the points of the bay and on the ships in the harbor, that they received from it a remarkable reflection.

On the 7th of September, two apparatus were installed on the paddle-boxes of the steam-boat *Le Caméléon*. The light extended to Montebello—from 7 to 8 cables in length—and was so brilliant that on the bridge a journal was read, with some difficulty it is true. The side of the vessel was as light as day.

Here our correspondent adds:—

I will at present confine myself to adding that the commissioners estimate the consumption of oxygen gas at 70 quarts per hour. It was not the same in different trials. In the first 160 quarts were consumed to one atmosphere during three hours; in the second, 160 quarts to one atmosphere and two-thirds.

The commission was presided over by M. Delassaux, *commandant-supérieur* of the ships in the Mediterranean, one of our most skilful and scientific officers.

The experiments were made at the request of M. de Varaigne, director of the Sideral Gas Company. This company declares that apparatus similar to those put in operation at Toulon cost only 15 centimes for ether per hour, and that to produce 1,000 quarts of oxygen at the pressure of one atmosphere, it consumes, on the average, 20 kilogrammes of good German manganese (from Giessen?) at the price of 50 francs the 100 kilogrammes.

New experiments are about to be made, by the order of the minister, on this new mode of lighting at sea.

PRESERVATION OF WOOD BY MEANS OF CONCENTRATED SULPHURIC ACID.*

Covering with tar is certainly one of the most ancient and most efficacious means which can be employed for the preservation of woods; doubtless, it does not completely and permanently prevent the deterioration of woods, but it is at all events far superior to all the processes which have lately been extolled for this purpose in different countries. In Germany, where gas illumination is not yet very common, and where coal tar is proportionally high priced, because vegetable tar is itself dear, a process is adopted to secure wood from rotting when exposed to humidity or fixed in the earth, or even when it is occasionally steeped in water, which it is as well to be acquainted with.

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* *Moniteur Industriel.*

This process consists in enduing wood with a layer of concentrated sulphuric acid. This acid not only carbonises the surface of the wood, but likewise forms with the ligneous fibre a coatingwhich perfectly protects it from external influences; besides it prevents rottenness arising from the internal development of cryptogamic vegetations, &c. At Chemnitz, this kind of painting has been employed for the last ten years, with remarkable success, for the piles used in building bridges, the supporting of mines, stakes, props, &c. The expense is very trifling, because sulphuric acid is very cheap, and because it requires to be employed only in a very thin layer. The method appears, moreover, to be in almost every respect cheaper than tarring, and more efficacious: the process is extremely simple. It is possible, and even presumable, that this method has already been proposed; but it is certain that it is very little known, and that some men of science have even doubted its efficacy.

Moreover, the experiment is easily repeated, and, in order to test the goodness of the process, it is simply necessary to apply sulphuric acid on some wooden sleepers, which serve as supports in the construction of railways, and to observe whether these sleepers — which, in some circumstances, constitute one of the heaviest expenses of the companies for repairs, since they require to be replaced every two or three years,— would last longer after having received the application of sulphuric acid than when laid down in their natural state. Different preservatives and different modes of preserving woods might likewise be comparatively tested.

ON THE DRESSING OF ORES.

BY MR. BRUNTON.

Mr. Brunton, of Neath, thus describes his ore dressing machine:—

The ore, or rather the materials containing the ore, are taken from the crushing machine and divided into classes of the same bulk, by the operation of a large series of sieves fixed together, and immersed in a cistern of water, the upper being the coarsest, and each sieve in succession gradually finer to the undermost, and having a motion communicated to them, by which the stuff that will not pass through the respective sieves, is worked off at the end of each, and falls into a separate receptacle; and by this classification is prepared for the operation of the separator, which consists of a trunk filled with water, about sixteen feet deep, into which the materials are suddenly and freely precipitated. In falling, they separate themselves according to the specific gravity of the respective particles—the heaviest reaching the bottom first, and passing through the shoot, are deposited in the first receptacle; the shoot is then moved to the next compartment, where another portion of the material, of less specific gravity, is deposited in the first receptacle; the shoot is then moved to the next compartment, where another portion of the material, of less specific gravity, is deposited, when the shoot is again moved, and conveys the remaining portion (generally refuse), into the third compartment. By the movement of the shoot (which is suspended upon a pivot at each end), the separation is effected, so that all that falls in ten seconds may be put into the first receiver, all that falls between ten seconds and fifteen seconds into the second, and all that falls between fifteen and twenty seconds, into the third, and so on to six, if necessary. The times for moving the shoot, are suited to each class of materials, and are measured by an accurate pendulum clock, by operating upon the lever, which precipitates the materials, and also moves the shoot at the times determined on by the superintendent, as best suited to the materials under operation, leaving nothing to be attended to but to charge the machine, such charge amounting to one cwt., more or less, according to the size of the machine, and the average time not more than a minute and a half. The construction of the machine is such, that nothing is lost or washed away—but the refuse is subjected to inspection until it is deliberately rejected as worthless. The importance of this apparatus will appear when we consider, first, the competition which the Cornish copper mines have now to maintain with the foreign ores; secondly, that if the ores which are now sold of five produce, were raised to eight produce, the price of the copper contained would be increased ten per cent.; and, thirdly, that every ton of refuse contained in the ores sold between five and eight produce, is virtually a loss to the miner of from 18s. to 21s.

ON MANURES AND THEIR COMPARATIVE VALUES.

BY MM. BOUSSINGAULT AND PAYEN.

SYNOPTICAL TABLE OF THE EQUIVALENTS OF MANURES.

Substances.	Equivalent of the dried Substance.	Equivalent of the Substance in the Normal State.	Observations.
Farm-yard dung	100	100	Taken as a term of comparison.
Autumnal leaves :—			
Oak	125	34	
Beech	102·3	33·98	
Poplar	167·2	74·34	
Acacia	125·2	55·47	
Pear tree	127·0	29·40	
Madia Sativa in green manure	126	88·88	Roots, stems, leaves, and flowers.
Box	67·5	34·18	Branches and leaves.
Grounds of cyder apples	309	67·79	Residue dried in the air, taken as in the normal state.
Grounds of hops	87·6	66·65	Residue containing 1·73 water.
Scum of defecations	127·1	74·65	Of a beet-root sugar refinery.
Exhausted slices	110·7	4136·50	Of beet-roots macerated.
Cake of seeds of cotton	32	9·99	
,, camelina	32·8	7·25	
,, hemp	40·8	9·50	
,, poppy	34·2	7·46	
,. beech	55	12·08	Very ligenous, employed as fuel.
,, nut	34·8	7·63	
Dung of inns of the South	93·7	50·63	
Guano	31·4	80·40	Imported into England.
Idem	27·7	74·10	Sifted.
Idem	12·4	28·60	Imported into France.
Litter of silkworms	56·6	12·17	Fifth age.
Idem	52·5	12·15	Sixth age.
Chrysalises of silkworms	21·6	20·61	
Urine	11·1	2·37	Of the public urinals, dried.
Idem	8·4	55·95	Liquid (comprising ammonia.)
Black of refineries	102·5	27·91	In the department of Mayenne, brought from Paris.
Manure called Dutch	78·6	29.40	At Lyon, animalised black.
English black	24·3	5·75	Blood, lime, and soot.
Residues of Prussian blue	6·9	30·62	Animalised with blood.
Sea herbs	7·0	1616	Animalised with fæcal-matter.
Idem	7·1	16·70	Idem.
Mould	189	33·33	Dried and sifted horse-dung.
Sea shells	3750	769·23	Of the shores of Dunkirk.

NOTE.—The numbers of the first column indicate the quantity of each manure which would replace 100 of *dry* dung. The cyphers of the second column indicate the quantity of each manure which would replace 100 of *humid* dung.

TABLE OF THE ANALYSES AND COMPARATIVE VALUE OF MANURES.

Designation of the Substances.	Normal Water.	Weight of the dry Matter employed.	Nitrogen Cubic in Centimetres.	Temperature Fahr.	Pressure.	Nitrogen per cent. in the dry Matter.	Nitrogen per cent. in the Normal Matter.	Strength.		Remarks.
								Dry Substance. A	Substance in the Normal State. B	
Farm-yard dung	79·3	gr. 4·0755	66·1	48·5	0·745	1·95	0·4	100	100	
Autumnal leaves										
Oak	24·99	0·353	4·75	57·5	0·751	1·565	1·175	80	293	
Beech	39·3	0·492	8·	59·0	0·761	1·906	1·177	77·7	294	
Poplar	51·1	0·553	5·5	59·0	0·761	1·166	0·538	66	134	
Acacia	53·6	0·372	5	59·0	0·7516	1·557	0·721	79·8	180	
Pear-tree	14·5	0·593	8·2	65·8	0·743	1·53	1·36	81·5	340	
Madia satira in green manure	70·55	0·31	14·0	66·5	0·761	1·534	0·45	78·6	112·5	Root, stalks, leaves, and flowers.
Branches and leaves of box	59·26	0·488	12·25	62·7	0·7562	2·89	1·17	147	292·5	
Grounds of cyder apples	6·4	0·716	3·7	42·8	0·747	0·63	0·59	32·3	147	(1841) Previously dried.
Grounds of hops	73·05	0·439	8·50	60·35	0·749	2·228	0·60	114	150	Hops of the first quality, Germ. (Brewery of Batignolles.)
Scum of defecations	67·0	0·488	6·5	59·0	0·769	1·579	0·535	80·9	134	Vinous (process of M. Dombasle).
Slices of exhausted beet-root		0·691	10·25	59·36	0·7695	1·758	0·009	90·1	2·2	*Idem.*
Cake of seeds of cotton	94·50	0·332	13·25	71·6	0·7607	4·524	4·02	232	1000	
" of camelina	11·02	0·668	32·3	45·3	0·754	5·93	5·515	304	1378	
" of hemp	6·5	0·584	24·7	45·5	0·753	4·78	4·21	245	1052	
" of poppies	5·0	0·714	33·2	43·7	0·753	5·70	5·36	292	1340	
" of beech	6·0	0·718	20·7	43·7	0·752	3·53	3·31	181	828	Very ligneous cake, employed as fuel.
" of nuts	6·2	0·719	34·0	44·6	0·752	5·59	5·24	286·6	1310	
Dung of the inns of the south	6·0	0·493	9	61·70	0·745	2·083	0·79	107	197	Communicated by M. de Gasparin.
Guano imported into England	60.58 19.56	0·766	40	58·10	0·766	6·201	4·988	323	1247	In the normal state.

Guano, purified by sifting......	23·40	0·480	29·50	60·44	0·741	7·047	5·398	361	1349	Globular concretion extracted by sifting.
,, imported into France....	11·28	0·266	37	65·30	0·746	15·732	13·950	806·7	3487	Strong putrid odor.
Silkworms' litter, 5th age......	14·29	0·498	15·	60·8	0·754	3·483	3·285	178·7	827	From the menagerie of Neuilly.
,, ,, 6th age......	11·39	0·361	11·25	59·0	0·773	3·909	3·290	190	822	*Idem.*
Chrysalises of silk worms......	73·50	0·318	25	63·50	0·760	8·987	1·942	461	485	Of the *bergeries* of Sènart.
Urine of the public urinals	9·57	0·363	55	59·0	0·751	17·556	16·853	900·2	4213	Dried on a stove.
Idem	96·889	0·150	25	58·10	0·752	23·108	0·715	1133	179	Liquid. 100 cubic centimetres gave 3 gr. 617 of residue; account was taken of the volatile products.
Black of refineries (Mayenne) ..	27·65	1·038	16·5	58·6	0·774	1·901	1·375	97·4	343·7	
Dutch manures..............	44·12	0·382	8	57·5	0·764	2·478	1·36	127	340	Animalised black of Lyon.
English black	13·45	0·260	18	59·0	0·751	8·022	6·952	411·4	1738	Blood, lime, and soot.
Residue of Prussian blue + blood	53·40	0·466	11	59.0	0·7704	2·8031	1·306	143·7	326	
Animalised marine plants......	12·54	0·645	15·5	65·67	0·757	2·756	2·408	141	602	Dried on a stove; sent by M. de Gasparin.
Idem..................	11·72	1·008	24·25	57·5	0·760	2·714	2·395	139	598	,, ,, ,, sent by M. Pommier.
Mould	,,	1	8·7	45·5	0·739	1·03	,,	52·8	,,	Of horse-dung in the dry state, and previously sifted to remove the straw.
Sea shells	,,	2·130	1·00	75·2	0·7625	0·052	0·052	2·67	13	Previously dried.

Note.—In column A, the strength of each manure, supposed to be in the dry state, is compared with that of dried dung represented by 100.

In column B, the strength of each manure in the ordinary humid state is compared with the strength of humid dung represented by 100.

It is evident that the farm-yard dung differs especially from the dung of inns, in the proportion of dry matter; the first contains 0·2, and the second represents 0·4. These data may serve for calculating the limit of the benefit proposed to be derived from drying dung, in order to reduce the expense of conveyance.

ORLANDO JONES'S PATENT RICE STARCH.

A sample of the rice starch, manufactured by Orlando Jones and Co., has been submitted to us for examination, and we feel much pleasure in bearing testimony to its purity and superiority.

It is well known that this article is prepared by the action of an alkali on rice, which removes the impurities and leaves the fecula pure.

Our opinion of its superiority is based on the operation to which it is submitted, a minute portion of the alkali remaining, preventing the action of the acid—which is invariably formed when starched goods are laid by for some time, as from season to season, on the fabric of which they are composed. The fact that, when cotton goods are laid aside starched, they are frequently found to be very rotten, is well known to every laundress, as well as to every housewife; a portion of acetic acid being formed as we have frequently proved.

The numerous testimonials from practical persons is quite sufficient to prove the worth of the article, and render lengthened remarks from us superfluous; it has one recommendation as the purest fecula that ever came under our notice.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ON OINTMENTS AND WAX.

BY M. DESCHAMPS.

In undertaking a work on ointments, it was not my intention to ascertain whether all the preparations which bear this name are well designated, whether the motive which caused the name of ointment to be given to all these preparations is due to the possibility of replacing the fatty bodies by one another, to their similarity of action, to custom, or to the difficulty of finding names by which to characterise them; but I desired to ascertain if all the fatty bodies could be replaced—if one of them should be preferred for a certain preparation—if some ointments which are only magistral, might not become officinal, and if the eremacausis of the fatty matter could be prevented or delayed.

Being struck with the little alterability of *unguentam populeum*, I thought that preservation was due only to the resinous matter which the fat may extract from the buds of the poplar, I thought that the part of the beuzoïn which is soluble in fat, might also prevent its alteration, and to produce an agreeably aromatised fat, and I prepare these fats in the following manner:—

	grammes.
℞ Coarsely powdered benzoïn	120·00
Newly melted lard	3000·00

Heat in a sand bath during two or three hours, strain without pressing and occasionally agitate during cooling.

	grammes.
℞ Buds of poplar	500·00
Newly melted lard	3000·00
Water	250·00

Heat in a tinned basin until all humidity is driven off; strain through a cloth, and occasionally stir during cooling.

After having ascertained that these fats which I have called *benziuated* and *populinated* fats, did not present, after several years, any alteration in odor, I sought for reagents capable of showing whether this preservation was real, and of pointing out whether there was any difference between these fats and the ordinary fatty bodies. I knew that red oxide of mercury was altered by the ordinary fatty bodies, and the facility with which the fatty bodies are acidified when they are mixed with acetate or subacetate of lead. I ascertained that iodide of potassium might be used for promptly detecting the rancidity or acidity of fatty bodies, and I was able to conclude, by means of experiments which it would be useless to describe, sinec the results are presented by the formulæ which I propose, that the least alterable fatty bodies are the benzinated and populinated fats, and that the next in order is carefully melted butter; that populinated fat, on account of the coloring matter which it removes from the buds, becomes of an orange color from the action of the alkaline substances, or or of those which act in the same manner; that this alteration is confined to the coloring matter, since the subacetate of lead, after a very long time, only colors it without changing its normal odor.

The following are some of the formulæ:—

OINTMENT OF IODIDE OF POTASSIUM.

	grammes.
℞ Iodide of potassium	4·00
Water	4·00
Benzinated fat............	30·00

This ointment may also be prepared with populinated fat, or with butter, because six months after its preparation it presents no alteration.

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* *Journal de Pharmacie*, Sept., 1843.

OINTMENT OF LYON.

	grammes.
℞ Red oxide of mercury	2·00
Benzinated fat	32·00
Volatile oil of roses	2 drops.

This ointment may be prepared with butter, but it does not keep so well as when prepared with benzinated fat.

REGENT'S OINTMENT.

	grammes.
℞ Acetate of lead	4·00
Red oxide of mercury	4·00
Camphor	0·50
Benzinated fat	80·00
Volatile oil of roses	8 drops.

This ointment can only be prepared with benzinated fat. A year after its preparation it was as good as when first made.

JANIN'S OINTMENT.

When prepared according to the following formula, this ointment was not rancid a year after its preparation:—

	grammes.
℞ Populinated fat	20·00
Prepared *tuthie*..........	10·00
Armenian bole	10·00
Ammoniacal oxychloride of mercury..............	5·00
Volatile oil of roses	5 drops.

ROSET OINTMENT.

In order to have a roset ointment capable of being preserved for a very long time, it is sufficient to add, in preparing it, 60 grammes of poplar buds to 1 kilogramme of lard.

DOUBLE MERCURIAL OINTMENT.

This ointment, prepared with populinated fat, was not rancid eleven months after its preparation.

Lip-salve is prepared in almost all laboratories, by employing wax, oil of almonds, and sometimes a small quantity of spermaceti. The following preparation gives a good ointment which does not turn rancid, and which does not produce a disagreeable impression, owing to the granulation of the salve, which granulation is formed in a well made ointment, by a sudden variation of temperature:—

	grammes.
℞ Populinated fat	120·00
Newly melted or populinated suet..................	40·00
Alkanet	8·00

Place the whole in a tinned saucepan, heat gently, strain through a cloth, and perfume with volatile oil of roses 12 drops; mix and cool quickly, stirring occasionally.

From the foregoing facts it results:—

That ointment of iodide of potassium can be prepared only with the benzinated and populinated fats, and butter:—

That those of Lyon and Regent should be made with benzinated fat:—

That a small quantity of poplar buds, added to its constituent principles of *Roset* ointment, suffices for preserving it.

That double mercurial ointment, prepared with populinated fat, may be preserved for a year without becoming rancid.

That benzinated and populinated fats are preferable to all fats.

That benzinated fat, on account of its whiteness, should be preferred when ointments should be white, or when there enters into their composition a body which may act as an alkali.

That populinated fat resist oxidation better than other fatty bodies.

(The conclusion of this article unavoidably postponed until our next.)

ON DISPENSING, AND SOME MALPRACTICES CONNECTED THEREWITH.

To the Editors of The Chemist.

GENTLEMEN,—

ANXIOUS to see the high character of the *really* respectable chemist and druggist maintained, and deprecating the modern combination of the surgeon, apothecary, cupper, dentist, chemist, druggist, &c., &c., all in one, to eke out a living—derogating, as it does, from the dignity and high-toned professional character which distinguish the the truly respectable, I cannot but regret the deviations from the formula of the London Pharmacopœia practised by some houses of business—such deviation causing great dissatisfaction, and even suspicion, in the mind of the patient. The slightest difference in the color of a mixture is quite sufficient to produce such an effect; now, we are all aware that, in the article of the oxymel scillæ, if the acetum scillæ be made with the brown instead of the distilled vinegar, a very different colored oxymel will be produced; and yet some druggists state that they prepare it as formerly, although the pharmacopæia directs the acetum distillatum to be used.

Again, as regards some of the tinctures and colored syrups, the difference is often very great, arising from the omission of part of the saffron or cochineal ordered. There certainly ought to be some power to *compel* all parties to adhere strictly to the Pharmacopœia.

I am aware it is the custom with many

physicians and surgeons to direct their patients to have their medicines dispensed at a particular shop; this, in many instances, is a fraud on the public, as it is well known that such practitioners are in the habit of receiving a per centage on the medicines from the favored druggist, whilst the patient is made to pay smartly for his physic; moreover, the fair trader is injured thereby, inasmuch as he is deprived of a portion of business, which otherwise would occasionally fall to him. Another evil is the difference of charges made by different shops. Why not have a scale of prices regulated by the trade, in order to establish uniformity everywhere, save at a certain *great hall*, where the charges are nearly double those of the respectable druggist. "So much in a *name*," whereby the public is so foolishly fleeced! Oh, reform it altogether! It is of no use to wait for either *Jacob* or his journal, so reform it yourselves.

Yours, respectfully,
PATRIOTICUS.

Nov. 15, 1843.

NEW FORMULA FOR AN ARSENICAL SOLUTION.*

BY DR. DEVERGIE.

FOWLER'S arsenical solution is, as every one knows, so energetic a medicine, that it can be prescribed only by drops; the slightest error in dosing with such a preparation may cause fatal accidents. Impressed with these considerations, Dr. Devergie, physician to the *Hôpital Saint-Louis*, proposes to substitute for Fowler's formula, the following, which allows of our prescribing in grammes the smallest doses of arsenite of potassa:—

℞ Arsenious acid	0·10 centigrammes
Carbonate of potassa	0·10 ,,
Distilled water.....	500·00 grammes
Compound tincture of melissa	0·50 centigrammes
Tincture of cochineal	Sufficient to give a deep color.

Every gramme of this solution represents one five-thousandth or two ten-thousandths of arsenious acid, whilst Fowler's solution contains one centigramme in each gramme, which is 50 times stronger than the above.

Indeed, Fowler's solution is prepared according to the following formula:—

Arsenious acid	5 grammes
Carbonate of potassa	5 ,,
Distilled water	500 ,,
Compound tincture of melissa	1 ,,

Mr. Devergie's observations have been approved by the General Council on Hospitals, which has authorised the employment of the new preparation. The author recommends its being colored of a deep rose, in order that by sight alone its presence may be detected in a julep. He has given it the name of *Devergie's Mineral Solution.*

[The editors of the *Journal de Pharmacie* remark that a gramme (15½ grains English) of this solution does not represent, as M. Devergie says, one drop of Fowler's solution, but rather better than half a drop.]

SODA WATER SPIGOT.

SIR,—

SOME years ago, while conversing with an eminent physician in Rotterdam, on the progress of medical science, he remarked, and most justly, that Read's domestic machine and stomach pump, was the most useful contribution which the mechanical arts had made to our profession. I would now bring under the notice of the public and the profession another useful auxiliary, which, I have no doubt, when sufficiently known, will be abundantly appreciated; I allude to the soda water screw, or spigot, invented by Mr. James Milne, the respectable and ingenious brassfounder, of Chalmers' Close, Cannongate, Edinburgh, and for which, I believe, he has taken out a patent. The instrument is fitted up in a neat case, about the ordinary size of a snuff-box, having printed directions, of which the following is a copy:—

TO DRINK A BOTTLE OF SODA WATER WITHOUT DRAWING THE CORK.

"*Directions for Using.*—The wire must not be loosened; but, to make room betwixt the double wire to allow the cock to screw in, put the point of the broach under the wire, on the top of the cork, in an inclined direction; point outward, and press each wire towards the side. Observe the length of the cork, by applying the broach, which should not go quite through; then force in the broach into the centre of the cork, turning it round so as to cut the cork, making a hole to receive the screw of the cock; then put one of the loose points into the end of the screw, and introduce it into the hole made in the cork, holding the bottle mouth downwards to prevent the point dropping out.

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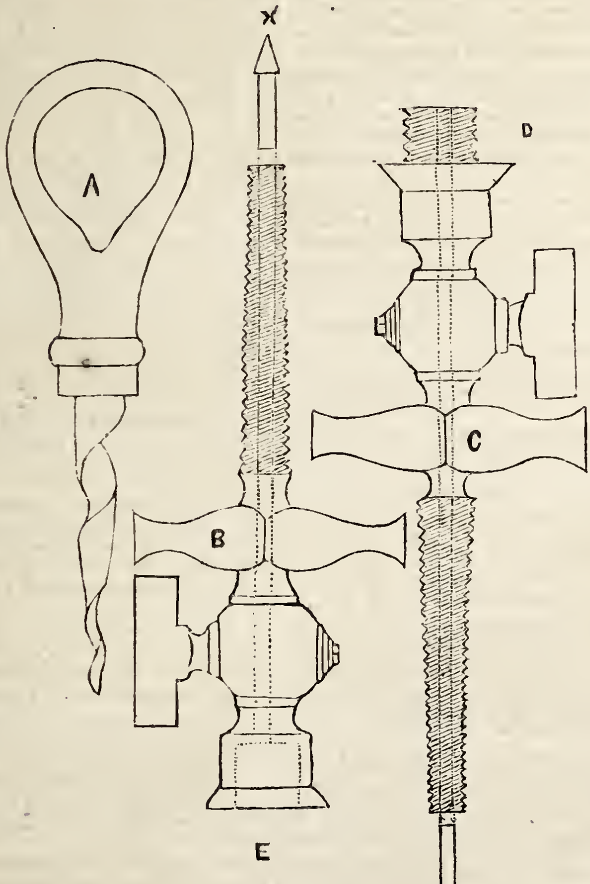
* *Bulletin de Thêrapeutique*, as given in *Journal de Pharmacie*, Oct., 1843.

Screw in the cock, pressing pretty hard, till the point of the screw is seen under the cork. Should the pressure prevent the point from dropping into the bottle, give the bottom of the bottle a gentle blow on the floor, and the point will drop; then, holding the bottom of the bottle upwards, turn the cock, and draw the quantity required; by which means two or more draughts may be had from one bottle, and the last as good as the first. When the bottle is empty, undo the wire, draw the cork, and recover the point."

The accompanying diagram will better explain the nature of the instrument.



A. The punch or gimlet, for nearly, but not entirely, perforating the cork.

B. The tap or screw, with the ⋊ point, with which it is armed, before being introduced into the hole cut by the gimlet.

An improvement has been suggested by the writer of this article, by which the redundant carbonic acid may be passed from the soda water bottle into any other liquid so as to make it effervescent. This consists of a second screw or tap, C. and which is passed through the cork of the bottle containing the liquid intended to be charged with the carbonic acid. The male screw D. is then passed into the screw E. The bottles thus connected, are held in a vertical position. The soda water bottle undermost, and the spigots of both bottles being then opened, the gas will pass from the soda water bottle to the liquid above, and, to make it abundantly effervescing, two or three bottles of soda water may be used for the purpose.

The value of aërated saline liquids in febrile diseases is universally admitted; but hitherto they have been used in an imperfect state, in consequence of the difficulty of retaining, in sufficient abundance, the carbonic acid gas. The invention of this beautiful instrument has, however, obviated the difficulty, and since it was brought under my notice, I may say that I have administered soda water, particularly in typhus fever, with the most satisfactory benefit. By means of this instrument, a mouthful may be taken at a time, leaving the residue of equal quality; and a bottle once armed and put beside a patient who can help himself, extends to him a comfort which may be readily appreciated. I have introduced it into our infirmary here, with much advantage, and I have little doubt that when it becomes better known it will be esteemed by the profession as a happy auxiliary to our other means of mitigating human suffering.

I am,
Gentlemen,
Your obedient servant,
JOHN INGLIS NICOL, M.D.

Inverness, 13th September, 1843.

EMPLOYMENT OF NUX VOMICA IN TIC DOULOUREUX.*

BY DR. ROELANDS, OF ROTTERDAM.

DR. ROELANDS has for six years successfully used nux vomica in prosopalgia, as well in inveterate as in recent cases. He has collected observations concerning twenty-nine subjects, of which twenty-one were treated by himself, and the others by Drs. Van der Hoven, Von Anckeren, Meerburg, Levie, Krierger, and Jones. Of these twenty-nine cases, twenty-five were cured, and three are still under treatment (two of which are almost cured); the last is that of a woman who would not continue the treatment.

Dr. Roelands gives vomica under the form of powder, in doses gradually increasing from 20 to 60 centigrammes and even more, in fractioned doses in the cours eof twenty-four hours. However, he expressly recommends the greatest care and circumspection in the administration of this medicine; he has seen subjects in whom the smallest doses were sufficient for determining very violent effects and in which it was necessary to diminish the dose of the remedy, or even to altogether suspend its employment. At all events, it is proper, as soon as the disease has yielded, to commence diminishing the quantities of the substance swallowed, still continuing its use for a certain time, in order more surely to guard against relapses.

The author regards nux vomica as deserving the preference over all the other means hitherto extolled against this redoubtable malady; and, in support of his opinion, he mentions a subject who, after having taken enormous quantities of sesquioxide of iron, without deriving any advantage beyond a transient relief, was promptly and perfectly cured by the employment of nux vomica.

EXTRAORDINARY CHANGE OF COLOR IN A MEDICINE.*

BY MR. BLELL, OF BERLIN.

MR. BLELL remarked a peculiar change of color on adding carbonate of magnesia to an infusion of the flowers of arnica, and he relates the fact in the following manner:—

The following prescription was brought to his shop:—

℞ Flowers of arnica	1 gramme.
Boiling water	100 "

Infuse, strain with pressure, and add:—

Powdered gum arabic. ..	12 grammes.
Carbonate of magnesia ..	60 centigrammes.
Syrup of marsh-mallow..	24 grammes.

M. S. A.

By chance, this draught remained several hours before it was sent for, and during this time it presented a remarkable change in its color.

The liquid, at first yellowish, gradually became greenish, at first light, then very dark, like a mixture of olive and grass green.

The infusion had been prepared with flowers of arnica of excellent quality, and contained no insects' eggs. It was necessary, therefore, to determine the cause of this transformation of color: the gum and the syrup of marsh-mallow were not the cause of it, as the ulterior experiments demonstrated.

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* *Alg. Konst en Letterbode.*

* *Gazette des Hôpitaux.*

This change was presented in treating the infusion of the flowers of arnica by carbonate of magnesia alone.

Decarbonated magnesia gave rise to the same phenomenon, but after a longer time.

Carbonate of potassa only rendered deeper the yellow color of the infusion. Liquid ammonia produced the same effect as carbonate of potassa.

Lime water determined turbidness and a white-yellow precipitate.

Acetate of lead occasioned a white-yellow precipitate.

Sulphate of copper determined a turbidness of a green-yellow color.

PLASTER FOR OBSTINATE ULCERS.*

BY DR. RADEMACHER.

℞ Olive oil	1000
Red oxide of lead	500
Powdered calcined alum	8
Powdered Karabè	24
Camphor	15

The oil and the minium are boiled together, stirring the mixture without interruption, until the whole has arrived at a proper plastic consistence. This done, the calcined alum is added, and carefully mixed.

This operation being terminated, the vessel containing the preparation is removed from the fire, and, when the heat of the mixture is somewhat diminished, the karabè is added, continuing to carefully mix it.

Finally, when the mass is cooled, so that one may touch the vessel containing it, without being burned, camphor, previously dissolved in a small quantity of olive oil, is added and intimately mixed.

The preparation thus obtained should be kept in small ointment pots, closed with a piece of bladder.

This plaster is especially indicated in cases of old rebellious ulcers of bad condition; it assists in a remarkable manner in effecting cure, but it is most particularly suitable when these ulcers have arrived at the period of cicatrization. Dr. Rademacher prescribes it as very efficacious, as a revulsive topic, in certain cases of profound affections.

PROPHYLACTIC SOAP AGAINST SYPHILITIC INFECTION.†

BY DR. PFEIFFER.

Dr. Pfeiffer, physician attached to the *etat-major* of St. Petersburg, has discovered a means of infallibly preventing syphilitic infection.

Dr. Pfeiffer made his experiments on this means by having recourse to inoculation: he put the virus arising from chancres in contact with the puncture during ten, fifteen, or twenty minutes, and in many cases even for twenty-four hours. He pretends that his prophylactic has never failed, and that it was not less efficacious when the syphilitic virus was applied to the mucous membrane of the anus, or to the entrance of the urethral canal in the *fossa navicularis.*

The trials, to the number of forty-two, which this physician made in the Venereal Hospital of St. Petersburg, under the rigid surveillance of a commission, gave the same results.

The following is the composition and mode of preparation of this prophylactic:—

℞ Bichloride of mercury	6	grammes
Hydrochlorate of ammonia	15	,,

Triturate in a marble mortar, or powder with a sufficient quantity of tincture of *thuya occidentalis;* add:—

Tannin (previously dissolved in a little warm water)	4	grammes

Mix well, and add to the mixture:—

Chloride of lime	45	grammes
Pure soda soap	500	,,
Tincture of *thuya occidentalis*	60	,,
Warm water	30 to 60	,,
Volatile oil of *girofles*	2	,,

F.S.A. a saponaceous mass.

Dr. Pfeiffer prescribes washings with this soap on the genital parts immediately after coition.

Dr. Dietrich confirms the good effects attributed to this new compound in the trials which he made at Munich, in order to assure himself of the reality of the results obtained by the physician of St. Petersburg. However, he found it less efficacious in cases of existing syphilis, although Dr. Pfeiffer affirms that he had prescribed it with success for combating the already developed symptoms of this affection.

The fourth part of the mixture indicated in the above formula is sufficient for one dose; for, besides that, we also obtain *balls* of soap of the size of a nut.

GASEOUS PURGATIVE ORANGEADE.*

BY M. MIALHE.

M. Mialhe (in the *Bulletin de Thèrapeutique),* gives the following formula for a laxative draught, having for its basis the least disagreeable of all saline compounds:—

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* *Sachs's Allg. Med. Central Zeitung.*

† *Journal de Chimie Medicale,* Oct. 1843.

* *Journal de Pharmacie,* August, 1843.

℞ Soluble cream of tartar...... 30
Dissolve in water............ Q.S.
Add
Orange Syrup.............. 100

Introduce into a seltzer water bottle, and then fill it by means of the ordinary apparatus, with

Gaseous water at 4 vols........ 500
Cork and tie.

It is evident, says M. Soubeirau, that, in this preparation, the orange-syrup may be replaced by any other agreeable syrup, such, for example, as those of raspberries, gooseberries, &c.

The inconvenience attached to soluble cream of tartar is its excessive acidity; it is partially disguised by the large dose of syrup employed; but, instead of an acid syrup which M. Mialhe recommends, it would be better to employ simple syrup, flavored with the tincture of the fresh peels of oranges or lemons.

POISONING BY THE EMPYREUMATIC OIL OF TOBACCO.

BY DR. DUESTERBERG, OF LIPPSTADT.

A LITTLE boy, aged 4 years, swallowed a tea-spoonful of the empyreumatic liquid which had been poured from the well of a pipe, and which had been laid aside in a cup.

Immediately after swallowing it, nausea, anxiety, faintness, convulsions of the extremities, and insensibility of the pupil, supervened.

An emetic was first administered; then a strong decoction of gruel acidulated with lemon juice; mucilaginous lavements; warm cataplasms to the epigastrium.

At the end of 24 hours the child was restored; however, he remained pale and without appetite for several days.

UTILITY OF POMMADE OF BELLADONNA IN CASES OF AGGRAVATED CONTRACTION OF THE UTERUS ON THE CHILD.†

BY DR. MEYERHOFER.

DR. MEYERHOFER has lately published several observations relative to the employment of frictions with pommade of belladonna on the abdomen, in cases where the uterus is strongly contracted on the surface of the fœtus placed transversely. This treatment promptly causes the contraction of the organ to cease, and renders turning possible, which could not be operated previously.

This practitioner employs for this object a pommade composed of fifty centigrammes of extract of belladonna, and thirty grammes of fresh butter; he applies it in frictions on the abdomen, and, when the aggravated contractions begin to yield, he introduces his hand, previously endued with this ointment, into the uterine cavity.

According to him, this means, in the cases in question, may be regarded as the *anchora sacra* of accoucheurs, and cannot be replaced by any other medication.

THERAPEUTICAL EMPLOYMENT OF PHOSPHORIC ACID.*

BY DR. GRUENBAUM, OF KOERMOND, HUNGARY.

FOR many years, Dr. G. has successfully employed dilute phosphoric acid in different diseases, especially in the bilious and intermittent fevers endemically prevailing in the country in which he practises.

He thinks that he has observed that the medicine acts by favoring the crisis in bilious fevers, which appears also to be the opinion of Dr. Kopp.

Dr. Gruenbaum cured, in a short time, by aid of this medicine, an inveterate quartan intermittent fever, which had obstinately resisted the employment of sulphate of quinine and bitters.

Phosphoric acid is an excellent agent in bilious dysentery, in acute bilious fevers, in abdominal typhus, as an adjuvant means, in quartan fevers (when the disease resists the action of common febrifuges).

The excitation which this agent determines in the organs of generation is well known; with regard to the injurious effect which it produces, according to Kopp, on the digestive apparatus, Dr. Gruenbaum has never observed it.

SINGULAR CURE FOR HABITUAL DRUNKENNESS.†

BY DR. SCHREIBER.

THE following singular means of curing habitual drunkenness is employed by a Russian physician, Dr. Schreiber, of Brzese-Litewski; it consists in confining the drunkard in a room, and in furnishing him, at discretion, with brandy diluted with two-thirds of water; as much wine, beer, and coffee as he desires, but containing one-third of brandy; all the food—the bread, meat, and the *legumes*, are steeped in brandy and water. The poor devil is continually drunk and *dort*. On the fifth day of this regima, he has an extreme disgust for brandy; he earnestly requests other diet; but his desire must not be yielded to, until the poor wretch no longer desires to eat or drink; he is then certainly cured of his *penchant* for drunkenness. He acquires such a disgust for brandy, that he is ready to vomit at the very sight of it.

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* *Gazette des Hôpitaux.*

† *Oesterr. med. Wochenschrift.*

* *Casper's Wochenschrift für die gesammte Heilkunde.*

† *Bulletin de Therapeutique.*

BELLADONNA IN PHIMOSIS AND PARAPHIMOSIS.*

BY M. DE MIGNOT.

M. De Mignot having successfully applied an ointment of belladonna in cases of phimosis and paraphimosis, recommends its employment in every case before having recourse to the knife. The ointment is made in the proportion of 12 grains of the extract of belladonna to 30 grains of simple cerate, and the prepuce is rubbed with this every hour. The dilating power of the belladonna soon begins to act, and in many cases an operation may be avoided. When the inflammation is violent, and the pain intense, he recommends the addition of a little opium and mucilage of quince seeds.

PARALYSIS OF THE UPPER AND LOWER EXTREMITIES FROM EXOSTOSIS OF THE VERTEBRA OF THE NECK, SUCCESSFULLY TREATED.†

BY DR. SKODA.

A day labourer, aged 23, was received into the Allgem. Krankenhaus of Vienna, the 23rd March, 1841, complaining of difficulty in moving his upper extremities, especially of the left arm, and having had some sense of rigidity in his lower limbs. He then complained of difficulty in moving his head, which by and bye could only be rotated, not inclined in any way. Pressure over the arch of the third cervical vertebra caused considerable pain. The patient was put upon the use of the hydriodate of potassa internally, and a salve of the tartrate of antimony was rubbed externally over the seat of the pain in the neck. This was without influence. Infusion of arnica, with tartrate of antimony, and then nux vomica, were next prescribed, and the spine was freely cupped. These measures seemed to have some slight, but only a very passing effect upon the disease. In the middle of July, the patient complaining of severe pain in the neck, a renewed examination of the part discovered a hard, circumscribed, unmoveable tumour of the size of a walnut. It was not itself painful on pressure. An ointment of mercury and hydriodate of potassa was now directed to be rubbed into the part night and morning, and various resolvent remedies were prescribed. On the 3rd September, the patient had a convulsive attack, and then suffered so much from dyspnœa, that he was threatened with death from asphyxia. In the beginning of December, the medical service was taken up by Dr. Skoda, who ordered the treatment by inunction to be immediately begun. One ounce of a salve, composed of equal parts by weight, of mercury and hog's lard, was rubbed daily, one half at night, and the other half in the morning, into the soles, legs, and insides of the thighs, and lateral and posterior parts of the thorax and abdomen. The mercurial fœtor was apparent in the breath after the seventh inunction. After the fifteenth friction, a slight depression was apparent in the tumour in the neck. After the sixteenth, the patient was able to move his fore-arm, and to turn his head. From this time he improved rapidly, and after twenty-four days' treatment upon this plan, when it was given up, he might be considered as well; he had recovered the use of his limbs, and might have returned to his occupation, had not an exostosis of the knee seemed to make some farther attention necessary.

COPAHINE MÉGE OF JOZEAU AND CO.

We have received from Messrs. Duhamel and Co., of Duke-street, Grosvenor-square, a box of these very elegant substitutes for the capsules of copaiba. We have had an opportunity of testing their efficacy, and we have no hesitation in saying that, for promptness and certainty of operation, they are not surpassed, if even equalled by any similar preparation of copaiba. The form is that of *bonbons coloriés*, and nothing but the sugar is tasted.

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* *L'Experience, and Edin. Med. and Surg. Journ.* October, 1843.

† *Oester Med. Zeitung*, No. 5, 1843, and *London and Edinburgh Monthly Journal of Med. Science.*

TREATMENT OF CROUP WITH THE SULPHATE OF COPPER.*

BY DR. SCHWABE.

This invaluable medicine in croup, first recommended by Serlo, has been used in more than fifty cases by the writer. He generally begins the treatment by applying from four to twelve leeches to the larynx, and then orders 1½, 2, 3, and occasionally even 4 grains of sulphate of copper, mixed with a few grains of sugar, to be taken every half hour or every hour, according to the urgency of the symptoms. Each dose is followed by vomiting, which, scanty after the first dose, is always copious after the second, and is continued so long as thick mucous or membranous concretions are apparent in the matters ejected. The patient then takes half a grain of the sulphate every hour, until several dark green motions have been discharged, to effect which from eight to twelve doses suffice.

PREPARATION OF THE MERCURIAL OINTMENT.*

BY M. DAVID.

M. David is of opinion that the mercury in this ointment is not oxydated, but merely divided. This, he says, is easily demonstrated. If 90 parts of fresh lard be triturated briskly for an hour with 190 of mercury in a mortar kept steadily at the temperature of 20° Cent., the mercury will be found to have disappeared entirely. But let the mass cool, and globules of mercury immediately begin to appear, and this they do, even for several days, in spite of all the rubbing that can be resorted to. But if so much oil of almonds be added as will keep the mixture of the consistence of honey (equal parts of lard and of oil of almonds), the globules of mercury will not reappear after they have once been subdued, and this may be done in a very short space of time.

IV. REVIEWS AND NOTICES OF BOOKS.

PRACTICAL MINERALOGY; *or, a Compendium of the Distinguishing Characters of Minerals, by which the Name of any Species or Variety in the Mineral Kingdom may be speedily ascertained.* By Edward J. Chapman. Illustrated with Thirteen Engravings, showing two hundred and seventy specimens. London: H. Baillière. pp. 192. 8vo. 1843.

It is not very often that an author completely succeeds in his attempts to render the study of a science more easy when he undertakes to simplify its classification; in fact, he more frequently renders worse confounded the confusion which he deplores and would rectify. To reform classification requires a mind of peculiar clearness and accuracy and a very acute perception.

In the beautiful science of mineralogy, the want of good classification has long been severely felt. It is true that several arrangements of minerals have been *attempted*, but they have failed in the most essential particulars.

Mr. Chapman's very creditable work, however, is free from the principal objections to former ones. It is compendious, yet not too brief; it is, in fact, just such a work as was wanted, and will lighten the labors of many a proficient mineralogist; moreover, affording, as it does, an easy guide to the study of minerals, it cannot but be hailed as a boon by those who are about to commence he study of the science.

The author, in a very well written preface, modestly admits that the book unavoidably contains some imperfections; stating that it is the production of "a young man" who has had to rely entirely on himself in its construction, and that it has been written at broken intervals, amidst the study and practice of his profession (that of an engineer). A production more effective of its object, whether that of an old or young author, we have not often met with.

We have but little time or space this month to enter very fully into the details of the classification adopted by Mr. Chapman.

Chapter I. treats of the distinctive characters of the parts, divisions, and sections to which all mineral substances are referred in the artificial arrangement of minerals in Chapter II.; of the methods to be observed in examining an unknown mineral substance, in order to discover its name, &c., by this work; and of the characteristic effects of the pure metallic oxides on the principal fluxes, as developed by the action of the blow-pipe.

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* *Casper's Wochenschrift*, No. 9, 1843, *and London and Edinburgh Monthly Journ. Med. Science.*

* *Journ. de Pharmacie*, April, 1843, *and London and Edinburgh Monthly Journal of Medical Science.*

Chapter II. contains "An artificial arrangement of simple minerals, with their descriptions, comprising—1. Their distinguishing or specific characters; 2. Constituent parts; and, 3. Principal localities."

Chapter III. comprises—"A natural arrangement of simple minerals, founded on their constituent parts, and the manner in which they occur in nature."

It is impossible to give an extract from this work; we must, therefore, content ourselves with recommending our readers to procure it, and judge for themselves.

APPLIED CHEMISTRY IN MANUFACTURES, ARTS, AND DOMESTIC ECONOMY. Edited by E. A. Parnell. With numerous engravings on wood, and other illustrations. London: Taylor and Walton. Parts I. and II., Oct. and Nov., 1843.

The importance to manufacturers of acquiring a knowledge of the principles of their processes has long been universally admitted, and we perceive with much satisfaction that the rising generation is paying considerable attention to the science of chemistry.

The publication of the work before us is calculated to render considerable assistance to manufacturers, provided that great care be exerted to ensure accuracy in the explanation of the theory and the description of the practice of every branch of manufacture. Such a work has long been wanted, and we hope that Mr. Parnell's "Applied Chemistry" will at least alleviate the want.

The first of the two parts before us commences the subject of gas illumination; the second completes gas illumination and begins the preservation of wood. We may here observe that the practice of dividing one subject into several numbers is rather objectionable, as it compels people to buy two parts where one ought to do. We are quite confident that this has not been done from any unworthy motive on the part of Mr. Parnell, who, we doubt not, will avoid it as often as practicable.

We recommend the work to our readers, and predict that it will succeed as it deserves.

We subjoin an extract from Part II:—

"NAPHTHALIZED GAS.

"One of the most important of the late improvements in gas illumination, is Mr. Lowe's process for napthalizing gas, or for impregnating ordinary coal gas with the vapor of naptha (pages 60 and 94), almost immediately before it issues from the burner. To effect this, the coal gas is passed either through some porous substance, as sponge or pumice stone, saturated with naphtha, or else over surfaces of that liquid contained in shallow trays. For the first method, a rectangular box is employed, called the *naphtha-box*, made of tin-plate or other suitable material, divided into two compartments by a vertical partition in the middle, but which does not quite reach to the bottom of the box. Each compartment contains a series of shelves, formed of wire gratings, on which are placed strata of sponge or pumice stone saturated with naphtha. The gas enters the box by an opening in the end at top, passes down through the several shelves of one compartment, then under the partition and up through the shelves of the other compartment, escaping from the box through an opening corresponding to that at which it entered.

"The apparatus employed to saturate the gas with vapor, by passing it over surfaces of the liquid, is equally simple. A rectangular box is fitted up with five or six shallow trays, to contain the naphtha, placed one over the other. Near the end of each tray is a slit or aperture, extending across the whole breadth of the tray, and furnished with sides rising to about half the depth of the tray. These apertures, which are placed alternately at opposite ends of contiguous trays, answer the purpose of waste pipes to conduct the naphtha from one tray to that next below it, when the liquid in the former rises higher than the side of the opening. The naphtha is poured by a funnel into the uppermost tray, which it fills to the top of the waste aperture, and then, falling into the trays below, fills them also in succession. When the naphtha issues from a small stopcock at the bottom of the box, a sufficient quantity has been introduced. The gas enters the box at bottom from the meter, and passing upwards through the several apertures, is exposed to the surface of the naphtha in each tray successively. By the time it reaches the top, it is thoroughly saturated with the vapor, and is then emitted for combustion.

"The latter plan is more convenient than the former in one respect, namely, that it does not require so frequent replenishing with naphtha. A thousand cubic feet of gas absorbs about a gallon of naphtha.

"The increase in the illuminating power of coal gas by being impregnated with naphtha is very considerable. A jet of hydrogen gas, which burns, when pure, with a pale blue flame hardly visible in the direct solar rays, gives a brilliant flame if the gas is passed through naphtha previous to being ignited. A good flame may be obtained even by impregnating common air, moderately warm (as the breath) with naphtha vapor. It has been estimated that one thousand cubic feet of naphthalised gas is equal in illuminating power to two thousand feet of common gas. If such is the case, the saving in this process amounts to twenty-five per cent., taking the cost of a thousand feet of gas at nine shillings. The expense of the naphthalised gas is—

	s.	d.
1000 cubic feet of gas........	9	6
1 gallon of naphtha..........	3	6
Licence for using the process per 1000 feet	1	0
Cost of naphthalised gas equal to 2000 feet of common gas....	13	6

Saving 4s. 6d., or 22 per cent.

"But it is doubtful whether the illuminating power of the gas is so much as doubled; according to another estimate, which seems nearer the truth, the saving is about 15 per cent., reckoning the common gas to be burned in the most advantageous manner.

The naphthalising box, of the construction first described, is made subservient to the separation of any traces of sulphuretted hydrogen and carbonic acid which may have escaped the ordinary purifying processes. To this end, the sponge or pumice stone in the first compartment, through which the gas passes, is saturated with caustic potassa or caustic soda, the shelves of the other compartment containing naphtha as usual. The small quantity of ammoniacal gas, which coal gas purified in the ordinary manner generally contains, not only deteriorates slightly the illuminating power of the gas, but is injurious to the pipes. To separate this, a third compartment is given to the naphthalising box, the porous material on the shelves of which contains dilute sulphuric, muriatic, or other suitable acid. The metallic partitions and sides of the box may be protected from the acid by a covering of a mixture of bees' wax and tallow. In a box of three compartments, the first may contain sulphuric acid, the second caustic soda, and the third naphtha."

TABLES OF THE CHARACTERISTICS OF CHEMICAL SUBSTANCES; *adapted to facilitate chemical analysis.* By Simeon Shaw, LL.D. London: Sherwood, Gilbert, and Piper, pp. 143. 8vo., 1843.

This is a useful little work; but the author has introduced into it such a peculiarity of expression as must render it of much less utility than if he had contented himself with the terms employed by every other chemical writer; not to mention some incorrectnesses in spelling of such frequent occurrence as to preclude the idea of them being entirely typographical—e. g. sol*l*icit, alcali. The following passages will show the peculiarities of which we complain:—

"Carbon (except as diamond) is dull, black, opaque, and inflammable; it powerfully *sollicits* oxygen in forming carbonic acid, also hydrogen, forming the gas now used to illuminate our towns."——"Fibrin is without odour, or savour, *indifferent* to water; acetic acid forms it into a bulky jelly, soluble in hot water; and alcohol at 0·81 converts it *to* adiposcire, soluble in ether and alcohol; *exhibiting* nitric acid at 1·2 forms an acid, *as nitrogen evolves.*"——"Albumen has alcaline *potency.*"—Uren is readily *appropriated* by alcohol and water; its compounds with oxalic and nitric acids are *sluggishly appropriated* by water;" with many other absurd terms, which the author, in any future edition, will do well to replace by those in common use among chemists, the want of *novelty* in whidh is amply compensated for by their appropriateness and simplicity. Novelty in the expression of chemical facts is quite the contrary of a desideratum. It is the duty a chemical writer to word his book in conformity with those of other chemists, and not to aim at originality in his diction to cover the want of it in his work.

As regards the tables, they are of average quality; they have their inacuracies and their redeeming points.

On the whole, the work may be recommended to our readers, despite the faults we have considered it our duty to mention, and we point them out in order that the author may, in any future edition, profit by our observations.

NEW METHODS OF ALKALIMETRY, AND OF DETERMINING THE COMMERCIAL VALUE OF ACIDS AND MANGANESE. By Drs. C. R. Fresenius and H. Will, Chemical Assistants at the University of

Giessen. Edited by J. Lloyd Bullock, late of the Giessen and Paris laboratories. London: Taylor and Walton.

In calling the attention of our readers to the above work, we shall not at this time enter into any discussion as to the relative merits of the new methods proposed in this volume as compared with those now in use, and our reason for this is simply because a review of the whole subject is in the course of preparation for this journal, in which methods for the accomplishment of the various objects of this work, and with which our authors are seemingly acquainted, will be laid before our readers, and the *subject* in every way extensively and fairly revised.

We, however, in the meantime recommend an attentive perusal of this work to all those who are interested in the various subjects of which it treats, and we promise them the acquisition of some careful knowledge.

BOOK RECEIVED.

The Tenth Annual Report of the Royal Cornwall Polytechnic Society, 1842. Parts I. and II. Falmouth: J. Trathan. London: Simpkin and Co.

TO CORRESPONDENTS.

A correspondent wishes that some of our Liverpool readers would inform him who were the first druggists in Liverpool who closed their shops at the early hour of 8 p.m., and who kept them closed the whole of Sunday.

Dr. Hare will perceive that we have, according to the request contained in his letter of the 25th October. inserted the errata in the present Number.

"W. O., Sudbury," is not forgotten.

"A Constant Subscriber, Liverpool."

Let us know where to address you, and we will put you in the way of doing what you require.

"R. C., Whitby," must first tell us what process he uses.

"A Lover of Chemistry, Oswestry," shall have a letter in reply to his communication.

"A Subscriber from the First." No. You will require both.

Mr. Moyle shall hear in a day or two.

"N. M., Liverpool," will receive a letter according to his request.

"J. D. E., Hull," must oblige us with his name and address, in order that we may communicate with him privately.

We have received many letters from New Subscribers; some of them will find the information required in the present Number. Others, who favoured us with the means, will receive letters.

To suit the convenience of such of our readers as may wish for answers to questions sooner than can be obtained through the "Notices" in our Journal, we have determined on the following. Letters sent *before* the 10th of each month will be answered on that day by private letter; those which are sent after that time, on the 20th; after the 20th, letters will be answered in the Monthly Number, or privately, on the 1st. Correspondents must send their names and addresses; or initials, and the post-offices of their districts, will do.

ERRATA.

In Dr. Hare's paper, page 438, col. 2, paragraph *(o)*, line 5, for the words "*so long as there should no longer be any copper to act in this capacity*, read, *so long as there should be no copper to perform the office of a cathion; and when there should no longer be copper to act in this capacity*.

Page 440, paragraph III., line 6, "ingredient agreably," read ingredient. Agreeably;" so that this last word may begin a sentence.

In the paper on the Health Commission at Liverpool, page 515, col. 1, line 28 from bottom, for "breeding," read "feeding."

Page 516, col. 1, bottom line, for "science," read "secrets;" col. 2, line 12 from bottom, after "*curious*," insert "nature."

Page 517, 1 col., line 18 from top, for "anything bad," read "anything *so* bad."

SUMMARY OF METEOROLOGICAL OBSERVATIONS MADE AT OTLEY, YORKSHIRE, IN SEPTEMBER AND OCTOBER, 1843.

BY E. THOMPSON.

SEPTEMBER.

BAROMETER.

Monthly mean	30·03
Mean at 9 a.m.	30·03
,, 3 p.m.	30·02
,, 9 p.m.	30·04
Maximum on 23rd....	30·42
Minimum on 27th	29·60
Range	0·82

THERMOMETER.

Monthly mean	57° ½
Mean of maxima	65
,, minima	49
Maximum on 2nd	73
Minimum on 29th	37
Range	36

WIND.

	Days.		Days.
N.	0	S.	0
N. E.	2	S. W.	0
E.	4	W.	17
S. E.	3	N. W.	6

RAIN.

0·17 inches.

WEATHER.

	Days.		Days.
Clear	17	Heavy rain....	1
Cloudy......	4	Thunder......	1
Showers	6	Lightning	1
Overcast	1		

GENERAL REMARKS.

This month may be divided into two periods, the former embracing the first three weeks, the latter the last week. The first period was always warm—often sultry; the second cold, and sometimes, by radiation, frosty. Both periods were unusually dry. Not $\frac{1}{5}$ of an inch of rain has fallen during the month.

OCTOBER.

BAROMETER.

Monthly mean	29·47
Mean at 9 a.m.......	29·47
,, 3 p.m.......	29·47
,, 9 p.m.......	22·97
Maximum on 19th ..	30·18
Minimum on 28th ..	28·59
Range	1.59

THERMOMETER.

Monthly mean	42°
Mean of maxima	47
,, minima........	38
Maximum on 1st	62
Minimum on 16th	27
Range................	35

WIND.

	Days.		Days.
N.	1	S.	0
N. E.	2	S. W.	3
E.	0	W.	13
S. E.	0	N. W.	8

RAIN.

3·84 inches.

WEATHER.

	Days.		Days.
Clear........	5	Frost........	12
Cloudy	4	Hoar frost....	3
Showers	9	Misty........	1
Overcast	2	Snow........	1
Continued rain	6		

GENERAL REMARKS.

The weather of winter has prevailed during this period. The thermometer has been on an average 6 or 8 degrees below the ordinary mean, and there have been twelve frosty nights. About the middle of the month a heavy fail of snow occurred, which remained on the ground for some days. Diseases of an inflammatory and febrile nature have been extensively prevalent.

NOTA BENE.—*All Communications, Books for Review, and Substances to be Analysed, must be addressed "To the Editors of the Chemist,* 310, *Strand, London." Communications must be prepaid, and sent before the* 15*th of each month; Books for Review before the* 10*th.*

INDEX

TO THE FOURTH VOLUME.

VOL. I. NEW SERIES.

N.B.—*For Names of Contributors, &c., see separate* Index *at the end.*

PAGE

Acari galvanici, development of, in ferrocyanuret of potash 69
Accident to Berzelius 209
Acid,
  aloëtic, coloring properties of.... 355
  antimonic.................... 103
  arsenious, poisoning by 512
  ——— antidotes for 520
  ——— effects produced by.... 283
  ——— poisoning by, treated by diuretics 331
  ———solubility of, in nitric acid 21
  butyric..................... 385
  carbonic, gas, treatment of gout with 224
  ——— quantity of, exhaled from the human lungs 101
  ——— gas, and the alkaline carbonates, decomposition of, by the light of the sun...... 444
  cinnamic, conversion of, into hippuric acid, in the animal organism 113
  ferric, on some of the properties of 15
  fluoboric, and hydrofluoboric acid, experiments intended to establish the difference between.. 485
  gallic, in menorrhagia 374
  hippuric, conversion of cinnamic acid into, in the animal organism.................. 113
  hydrochloric, diabetes mellitus cured by 87
  ——— of commerce, purification of 258
  ——— new means of detecting traces of sulphurous acid in 259
  hydrocyanic, and the substances containing it, on the kind of death determined by 421
  ——— effects of, in a poisonous, but not immediately fatal dose 375

PAGE

Acid—*continued*
  hydrofluoboric, experiments intended to establish the difference between fluoboric acid and 485
  hypochlorous, memoir on: with some observations on the same bodies considered in the amorphous and crystallized states 241, 339
  hypophosphorous, on the constitution of 63
  iodic........................ 62
  —— new process for preparing.. 541
  nitric, action of, on the carbonates of lime.................. 305
  —— application of, to external hæmorrhoïds 225
  —— solubility of arsenious acid in 21
  opianic, a new organic body derived from narcotin........ 55
  oxalic, preparation of 161
  phosphoric, therapeutic employment of 161
  prussic, chemical and toxicological experiments relative to 230
  pyroligneous, on pickling with .. 477
  sulphuric, action of, on organic matters.................. 245
  ——— concentrated, preservation of wood by means of .. 545
  ——— a preventive of lead colic 37
  sulphurous, action of, on the metallic oxides 481
  ——— action of, on the metals 349
  ——— experiments on the formation of the salts of with their analyses 433
  ——— means of detecting traces of, in hydrochloric acid 259
  ——— means of detecting in commercial products 160
  ——— and the alkaline sul-

PAGE
Acid—*continued.*
phites, on some separations operated by means of 193
Acids,
fatty composition of certain 299
—— principal, law of composition of 59
metallic, investigations concerning the 65, 103
molybdic and sulphuric 113
organic, new, containing chrome 161
Aconite, solution of, in rheumatic affections 333
in rheumatism 279
Adulteration of
alum, powdered 43
iodine 519
opium 426
oil of sweet almonds 519
potassa, sulphate of 374
tobacco 306
of the different chemical and pharmaceutical products, on the detection of the 184
Advertisement 1
Aërated sea water, a new purgative 429
—— waters, Bakewell's apparatus for the preparation of 233
Affinity, chemical and electrical, observations on 69
Agricultural chemistry 33
importance of, to farmers 74
study of, by farmers 74
Alkali, state of the, in the blood 165
Alkaline drinks as lithontriptics, precautions to be adopted in the employment of 129
Alkalis,
organic, alterations of, in contact with, and under the influence of, nascent oxygen 398
—— investigations concerning 199
vegetable, toxicological studies concerning 136, 177
Almond syrup, new formula for 424
Almonds, sweet, oil of, adulteration of 519
Alum, powdered, adulteration of 43
Ammonia as an application to bruises 430
delirium tremens treated by 227
gaseous, use of 231
carbonate of, action of, on plants. 34
Amennorrhœa, powder in 285
Amorphous. *See* Hypochlorous acid.
Amphide salts. An effort to refute the arguments advanced in favor of the existence, in the amphide salts, of radicals consisting, like cyanogen, of more than one element, 437, 488, 533
Analysis of the Scott spring, Scott county, Virginia 305

PAGE
Animal substances, composition of 119
Antimony, a new process for the absolute distinction and separation of arsenic from 520
Apparatus, Marsh's, on the distilled zinc employed in 119
Aqua chalybeata 43
Arsenic,
new process for the absolute distinction and separation of, from antimony 520
in bread 281
detection of, by copper 83
detection of, by Reinsch's test, in medico-legal investigations 510
two cases of poisoning by a cerate containing 227
Arsenical solution, new formula for 562
Arsenio-siderite, a new species of arseniate of iron, description of 111
Artemisia absinthium 186
Ashes, vitriolic, of Forges-les-Eaux, analysis of 407
Assœfetida, a cure for hooping cough 278
Association, British, meeting of, at Cork 441
Attraction of cohesion, on the 205

Bakewell's patent soda water apparatus 376
Battery, Grove's, use of carbon in 21
Bebeeru tree, the, of British Guiana 427
Beer, presence of a fatty substance in 541
Bees' wax. *See* Wax.
Belladonna,
collyrium of 424
in phimosis and paraphimosis 567
pommade of, utility of, in cases of aggravated contraction of the uterus of a child 566
Bell's (Mr. Jacob) answers to his correspondents 370
Betula, alraes, leaves of, as a resolutive 81
Bezoars. On the intestinal concretions of animals, known under the name of bezoars, and analysis of a new mineral bezoar 156
Bile, memoir on the 247
Bismuth, new sulphuret of 117
Blood, crassamentum of, the effect of colored devices of china ware on 436, 542
alkali in, state of 165
dragon's, on the products of the distillation of 495
Blowpipe and lamp, improved arrangement of 462
Bones, chemical composition of 56, 105
human, chemical composition of the 56
Books received, 48, 143, 336, 384, 480, 528
Bread, arsenic in 281
Butter, symptoms caused by 86

PAGE

Calico, fixation of iron mordants on .. 263
Calculus removed from the lachrymal canal, analysis of .. 111
Calculi in St. George's Hospital, remarks on .. 188
Calstron-baryte .. 22
Camphor, laurel, artifical preparation of .. 158
Cancer, schirrus and, treatment of .. 422
Cantharides,
  poisoning by .. 283
  ——— cure .. 84
Carbon, use of, in Grove's battery .. 21
Caseïn, investigations concerning .. 450
Cataplasm, acetic, in white swellings .. 229
Cattle, fattening of, and formation of milk, investigations concerning .. 212, 265, 315
Cements. *See* Lime.
Cerate,
  desiccative .. 37
  containing arsenic, poisoning by 227
Cerium, lanthanium, didymium, terbium, and erbium .. 446
Cerium, deutoxide of, on a means of separating deutoxide of didymium from .. 293
Charcoals, organic and mineral, analysis of .. 145
Chemistry,
  agricultural .. 33
  ——— importance of, to the farmer .. 74
  ——— study of, by farmers. 74
  spurious, the revenue in danger from .. 454
  modern, errors of .. 538
Chemists,
  pharmaceutical, of the United Kingdom, address to .. 172
  ——— second address to .. 220
  and druggists, debasing competition of .. 43
  ——— on some of the laws affecting .. 187
Chlorine,
  action of, on carburet of sulphur .. 296, 402
  oxygenous, compounds of .. 289
Cholera,
  Indian .. 126
  treatment of .. 39
  spasmodic .. 238
Cholesterine, action of potassa on .. 154
Chorea cured by mistake .. 376
Chromatype, a new photographic process .. 461
Chromates, alkaline, manufacture of, and analysis of chrome iron ore .. 70

PAGE

Chrome,
  on certain compounds of .. 299
  new organic acids containing .. 161
  ores of, new mode of assaying .. 484
Cicuta virosa, decoction of nut-galls as an antidote for .. 133
Cigars, mercurial .. 279
Cocoa, improved preparations of .. 406
Cod liver oil, skate liver oil preferable to 82
Coffee,
  solution of .. 230
  improved preparation of .. 406
Cohesion, attraction of .. 205
Colic, lead, sulphuric acid as a preventive of .. 37
Colliers, black spittle of, or melannosis, suggested remedy for .. 234
Collyrium
  of belladonna .. 421
  of Lugsor .. 230
Colutea arborescens, use of the .. 80
Combination, on the heat of .. 443
Commission, Health .. 276, 456, 513
Composition of animal substances .. 119
Consumption, grinders' .. 328
Copaiba,
  balsam of, solution of .. 510
  and rhatany, capsules of .. 425
Copal, on .. 165
Copper,
  antimoniuret of, as a cure for epilepsy .. 228
  arsenite of, poisoning by .. 41
  detection of arsenic by .. 83
  deutosubcarbonate of, poisoning by .. 86
  lead, corrosive sublimate and arsenious acid, antidotes for . 520
  iron, and silver, oxides of, action of potassa on .. 351
  sulphate of, and cyanuret of mercury, treatment of chancres by 39
  sulphate of, caustic paste of .. 332
Corn, Indian, oil of .. 27
Correspondents 48, 96, 144, 192, 240, 288, 336, 384, 432, 480, 528, 561
Creosote, a solution of, and a solution of chloride of lime, cure of sycosis by .. 139
Crinum asiaticum, a substitute for ipecacuahana .. 186
Cyanurets, sulphurous compounds, &c., analysis of .. 109
Cynara, anodyne power of .. 375

Daguerreotype. *See* Images.
Devices,
  colored, of china-ware, effect of, on the crassamentum of the blood .. 436, 542
Diamond, formation of .. 202

PAGE
Diapalmæ, emplastrum, practical considerations concerning...... 518
Diarrhœa of infants, analytical examination of matters passed in the 259
Dictamnus creticus................ 375
Didymium, deutoxide of, new means of separating deutoxide of cerium from.................... 293
See also Cerium.
Digestion of the herbivora.......... 389
Digitalis, toxicological and chemico-pharmaceutical investigations concerning 418
Diospyros, Virginiana, use of the unripe fruit of, as a therapeutic agent................ 125
Disease, statistics of................ 282
Diseases, intestinal, treatment of some 39
——— method of combating certain.. 201
Donations, economical.............. 86
Drug Club, Junior............ 422, 476
Druggists. *See* Chemists.
Drugs, sale of, by physicians........ 323
Drunkenness, singular cure for...... 556
Dyeing wool, woollen cloths, cotton, silks, and other fabrics and materials, improvements in.. 263

ELECTRIC
current of the muscles of living or recently killed animals .. 108
fluid, on the hygienic influence of climate in reference to the .. 281
shocks, opium smoking and, in asthma................. 283
Electricity, magneto, on the calorific effects of, and the mechanical value of heat 446
subterranean, notice of some experiments on, made in Pennance mine, near Falmouth 337
Electro-chemical application of oxides and metals on metals 457, 499
Elixir acidum Halleri (acidum sulphuricum aromaticum, or elixir of vitriol), in cases of neuralgia 232
Emetic, preparation of 277
tartar, effect of, on the genital organs 281
Emetised powder for destroying rats.. 330
Emplastrum diapalmæ, practical investigations concerning 518
Equivalents, chemical, considered as simple muetiples of hydrogen 19
Erbium. *See* Cerium.
Ergot of rye,
dysentery from 332
pills of oil of 376

PAGE
Ergot of rye—*continued.*
liniment of oil of.............. 376
oil extracted from 427
ethereal liniment of........... 376
Erysipelas, treatment of............ 40
Ether, nitrous, new means of preparing 543
Euclase in Connecticut 22
Excise, frauds on. Adulteration of tobacco 306
Exsudation, peritoneal, analysis of a .. 260
Extracts,
acetic 282
medicinal 414, 468, 507
FAT,
formation of, in animals 411, 503
substance of milk, nature of the.. 287
Fattening of cattle and the formation of milk, investigations concerning.............. 212, 265, 315
Fatty bodies, oily and, on the influence of temperature and climate on the fluid and solid states of.. 3
Fecula, means of communicating to, without the assistance of torrefaction or the acids, the property of dissolving in water at 160° F., and of retaining this solubility for twelvemonths or more 360
Feeding of horses; documents in support of the verbal reply of M. Payen to M. Magendie 366
Fermentation, urinary.............. 200
Ferments........................ 304
Ferruginous preparations, improved .. 425
——————— in various affections.................... 81
Flesh, muscular, of different animals, composition of the 165
Flint, potassa and lime in 112
Fluid,
lachrymal, of a horse, chemical analysis of................ 261
menstrual, analysis of the 118
Fluorine, iodine and, on the relative electro-negative powers of .. 447
Food, respiration and, Virey's objections to Liebig's theory relative to the uses of 257
Fuel, new method of preparing...... 210
Furnaces,
high, on the application of the the gas of, to metallurgical treatments 312
refining, investigations concerning the composition of the gases which are disengaged from; the carbonization of wood, and the production and employment o combustible gases in the metallurgical arts 309

PAGE
GALVANISING, new mode of 280
Galvanography, on................ 29
Gas illumination, summary of the official report on, presented by the Commission of Tonlon 545
Gaultheria procumbens, oil of, investigations concerning 300
Ginseng root, on.................. 477
Glycerine, remarkable metamorphoses of 495
Gold, white protochloride of 354
Gravity, specific, of metals, considerations concerning.......... 344
Guano,
  or huano 410
  of commerce, productions of 217
Gunjah,
  See Hemp.
Gurjun balsam, on the.............. 185

HALOGEN bodies, on some compounds of phosphorus with 64
Haloïd salts, and sulphurets of the alkaline metals, objections to Rose's, on the action of water on 60
Health Commission, the 276, 456, 513
Heat,
  mechanical value of 446
  of combination 443
Hemlock, poisoning by 332
Hemp,
  Indian, or Gunjah Canabis *Indica*), use of in cholera 127
  Indian 276
  (Indian hemp), extract of, in traumatic telanus.......... 186
Herbivora, the, digestion of 389
Hæmorrhoïds, external, application of nitric acid to 225
Homœopathy, death of the inventor of 428
Hope and Liebig, Drs. 188
Hydracids, on the combinations of water with 20
Hydrarygrum cum cretâ............ 521
Hydrencephalous swelling of a child, analysis of the liquid constituting a 261
Hydrophobia, cure for.............. 41
Hydrorachis, fluid of a, examination of 261
Hydro-electric machine 479

IMAGES, photographic, on a new process of polishing the plates destined to receive, permitting identical results to be obtained, so long as the external circumstances remain the same.................... 313
Iodine, absorption of, on the 131

PAGE
Iodine—*continued.*
  adulteration of 519
  on the action which, exters on the oxides by the intermedium of water, and particularly on that which it exerts on oxide of lead.............. 400
  and fluorine, on the relative electro-negative powers of .. 447
  and muriate of potassa, manufacture of................ 27
  palladium, chloride of, a test for 209
Iodoform, influence of temperature on the production of, and on the octohedral crystallization of iodide of potassium.................... 399

Iron,
  albuminate of 78
  arseniate of iron. Description of arsenio-siderite, a new species of 111
  citrate, or ammonio-citrate of.... 36
  —— preparation of 139
  —— on the preparation of 326
  copper and silver, oxides of, action of potassa on 351
  mordants, fixation of, on calico .. 263
  on assaying the ores of.......... 436
  hydrated peroxide of 87
  prepartions of 37
  protiodide of, employment of, in consumption 130
  wrought, new process for making direct from the ore 405
Ipecacuanha, crinum asiaticum, a substitute for 186
Itch, new treatment of 80

JACOB "again!" 476, 517
Jalap, resin of, on the adulteration of 280
Journal, Pharmaceutical, preface to .. 370

LACTUCARIUM, on 35
Lanthanium. *See* Cerium.
Laurel water, prepared by distillation.. 232
Lead,
  corrosive sublimate, copper and arsenious acid, antidotes for 520
  crystallized oxide of............ 401
  detection of, in the muscles paralysed by it 286
  remarkable case of corrosion of, by spring water, after passing through an iron pipe 444
  plasters, on the preparation of .. 181
  two cases of poisoning by, in Maccuba snuff 237
  white, on the formation of 28
  ——, on a process of making, which greatly diminishes the unhealthiness of the work .. 361

PAGE

- Lead—*continued.*
  - white, on a new process of making, by means of which the health of the workmen is not injured ... 365
- Lemon juice in dropsy ... 331
- Liebig, Hope and, Drs. ... 188
- Light,
  - influence of, on a great variety of metallic and other compounds ... 445
  - ——— of, on the growth of plants ... 463
- Likenesses, representations of nature and other objects, improved method of obtaining ... 29
- Lime,
  - carbonate of, with five atoms of water, analysis of ... 295
  - carbonates of, action of nitric acid on the ... 305
  - cement, artificial stone, and such other compositions, improvement in the process of manufacturing; more particularly adapted to working under water, and to the construction of buildings and other works which are exposed to damp ... 261
  - chloride of, solution of, and creosote, cure of sycosis by ... 139
  - and potassa in flint ... 112
- Liniment, oleocalcareous ... 333
- Liquors. *See* Malt.
- Lithontriptics, alkaline drinks as, precautions to be adopted in the employment of ... 129
- Lucifers, on the manufacture of ... 406
- MAGNETO-ELECTRICITY. *See electricity,*
- Malt liquors,
  - on the use of, 77, 278, 325, 371, 423, 472, 474
  - *versus* morals ... 178
- Manure,
  - improvements in ... 72
  - improved method of combining various materials, in a manner not hitherto in use, for the purpose of ... 71
  - or a composition to be used on land as manure, improvements in the manufacture of ... 34
- Manures,
  - and their comparative values, 120, 166, 218, 269, 319, 362, 408, 463, 547
  - soils and, analysis of ... 171
- Manuring powder, new ... 216
- Matches, lucifer, poisoning from ... 226
- Medals and other similar objects, copies of, new process for obtaining, by pressure on metallic copper ... 31
- Medical reform ... 75, 139
- Mercurial ointment in small pox ... 427

PAGE

- Mercury,
  - cyanuret of, and sulphate of copper, treatment of chancres by ... 39
  - oxide of, black, preparation of; with observations on color making ... 171
  - protiode of, employment of, in scrofulous affections ... 37
  - subnitrate of, on a preparation sold under the name of, and employed for the purpose of making ung. hyd. nit. ... 373
  - new mode of reducing, to form a ferruginated pill of mercury ... 183
- Metals,
  - alkaline, sulphurets of, and the haloïd salts, objections to Rose's views on the action of water on ... 60
  - electro-chemical application of oxides and, on metals ... 457, 499
  - improvements in coating or covering, with other metals, and in coloring metallic surfaces ... 31
  - precious, production of in Mexico, considered in its relations to geology, metallurgy, and political economy ... 306
  - sulphurous acid, action of, on ... 349
  - specific gravity of, considerations concerning ... 344
- Meteorological observations, summary of, made at Otley, Yorkshire, 144, 192, 240, 288, 336, 384, 432, 480, 560
- Metropolis, improvement in the ... 22
- Milk,
  - fat substance of, nature of ... 287
  - preparations of ... 406
  - of the cow, salts contained in ... 353
- Morphia, hydrochlorate of, preparation of ... 426
- Museum of the Pharmaceutical Society. Economical donations ... 86
- Mustard seed ... 286

- NAPHTHALINE,
  - as an incisive, expectorant medicine, with formulæ for its administration ... 82
  - in psoriasis and lepra vulgaris ... 287
- Narcotin, opianic acid, a new organic body, derived from ... 55
- Nectar of flowers ... 147
- Neuralgia, continental treatment of ... 428
- Neuralgic pains, new treatment of ... 39
- Nigellin, on ... 138
- Nipples,
  - ointment for affections of ... 139
  - sore, prevention of ... 287
  - —— remedial application for ... 424

PAGE
Nitrogen,
  true constitution of 493, 529
  new method of determining, on M. Reiset's observations relative to, and on the part which the nitrogen of the atmosphere takes in the pretended formations of ammonia 393, 447
  on a simple process for detecting the presence of, in small quantities of organic matter 197
Nitrogenous matters, neutral, of organisation 10, 49
———— principles, nutritive, of plants 115
Nitro-hydrochloric baths in cases of mercurial salivation........ 285
Nitrous oxide gas, impure, poisoning by inhalation of 85
Nut galls, decoction of, as an antidote for Cicuta virosa (hemlock) 133
Nux vomica,
  as a remedy for paraplegia 82
  case of poisoning by 227
  employment of in tic doulouroux . 227
Oil,
  Tallicoonah.................. 187
Ointment,
  for affections of the nipples...... 139
  mercurial, in small pox 427
Ointments and wax, on 427, 450
Olefiant gas, on the action of metals in ignition on 153
Olivile, on 299
Ononis spinosa, chemical analysis of the root of 112
Ophthalmia, variolous, prevention of.. 287
Opium,
  adulteration of................ 426
  proximate principles of 128
  smoking and electric shocks in asthma.................. 283
Orangeade, gaseous purgative........ 555
Oxide, nitrous, impure, poisoning by the inhalation of 85
Oxides, metallic, action of sulphurous acid on.................. 481
Oxygen gas, development of, arising from the organic deposit from the water of a saline spring.. 256
Paints, pigments, and vehicles, improvement in, and in modes of applying paints, pigments, and vehicles 402
Palladium, chloride of, a test for iodine 209
Papaver rhœas, analysis of the capsules of.................. 78
Paracentesis, chemical examination of a fluid extracted in a case of.. 261
Paracyanogen, on the formation of.... 444

PAGE
Pavement, patent elastic, Fanshawe's .. 365
407
Pepsin, the principle of digestion 5
Phenakite, supposed, from Goshen, Mass. 22
Phosphorus,
  as a cure for paralysis of the tongue 287
  on some compounds of, with the halogen bodies 61
  on the sulphurets of............ 291
Photographic pictures, coloring 166
Pills, anti-epileptic 376
Plants,
  action of carbonate of ammonia on 34
  growth of, influence of light on .. 463
  inorganic constituents of........ 72
  nitrogenous nutritive principles of 115
Plaster for obstinate ulcers.......... 555
Plasters, lead, on the preparation of .. 181
Platina in the auriferous sands of the Rhine 113
Platinum, double sulphite of the protoxide of, and soda, a new salt 291
Poisoning,
  on some obscure cases of 178
  two cases of, by a cerate containing arsenic 227
  by arsenious acid 512
  by arsenious acid, treated by diuretics 331
  of eight people from eating tainted black pudding 134
  by cantharides, cure 84
  by cantharides................ 283
  cherry-laurel by 332
  by copper, arsenite of.......... 41
  by copper, deutosubcarbonate of.. 86
  by hemlock 332
  by lead, in Maccuba snuff 237
  by the inhalation of impure nitrous oxide 85
  from lucifer matches 226
  by nux vomica, case of 227
  by cyanuret of potassium 42
  by adulterated tapioca.......... 331
  by the empyreumatic oil of tobacco 556
Poisons, on the sale of, and the Pharmaceutical Society 424
Pommade, Giacomini's 333
Potassa,
  action of, on cholesterine........ 154
  action of, on the oxides of copper, iron and silver............ 351
  and lime in flint 112
  nitrate of, incontinence of urine successfully treated by...... 326
  muriate of, manufacture of 27
  sulphate of, adulteration of 374
  and soda, improvements in the manufacture of the carbonates of 119

PAGE

Potassa—*continued.*
ferrocyanuret of, development of *acari galvanici* in 69
Potassium,
on the employment of cyanuret of, in chemical analysis 97, 149
ferrocyanuret of, employment of, as a reagent 259
———————— poisoning by.... 42
iodide of, octobedral crystallization of 399
———— preparation of........ 497
———— and veratria in tumefaction of the liver and dropsy.. 231
Potatoes,
means of preventing, from germinating 414
culture of, so as to have new potatoes in March........ 414
Poudrette, manufactured at Montfaucon, composition of........ 272
Purgatives, abuse of................ 327
Pus, influence of atmospheric air on .. 236

QUINCE-SEEDS on the employment of mucilage of, in collyria.... 285
Quinine
in asthma 279
sulphate of, association of, with carbonic acid in the treatment of marsh fevers............ 38
sulphate of, fatal dose of........ 229

RANULA, fluid of, chemical composition of 111
Remarks, laudatory, and suggestious relative to the improved series of "THE CHEMIST" 87
Resin,
fossil, from the environs of Bucaramangà (South America), analysis of a 118
of jalap, adulteration of 280
Respiration and food, Liebig's theory relative to the uses of, Virey's objections to.............. 257

REVIEWS:—
Chemical Manipulation: being Instructions to Students in Chemistry on the Methods of Performing Experiments of Demonstration or Research with Accuracy and Success. By Michael Faraday, D.C.L., F.R.S., F.G.S., M.R.I., Third edition, revised...... 44
Histoire de la Chimie depuis les temps les plus reculés jusqu'a notre Epoque; Comprenant une Analyse Détaillée des Manuscrits Alchimiques de la Bibliothéque Royale de Paris; un Exposé des Doctrines Cabalistiques sur la Pierre, Philosophicale; L'Histoire de la Pharmacologie de la Metallurgie, et en Général des Sciences et des Arts qui se rattachent à la Chimie, &c. By Dr. F. Hoefer. Tome I. 47
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The London Journal and Repertory of Arts, Sciences, and Manufactures; containing the Specifications of New Patent Inventions. Conjoined Series, No. CXXXII. Conducted by Mr. W. Newton......... 47
The London and Edinburgh Monthly Journal of Medical Science. Edited by John Rose Cormack, M.D....... 47
On Gravel, Calculus and Gout; chiefly an Application of Professor Liebig's Physiology to the Prevention and Cure of Diseases. By H. Bence Jones, M.A., Cantab, Licentiate of the College of Physicians, Fellow of the Chemical Society 88
A Treatise on Manures; their Nature, Preparation, and Application: with a Description and Use of the most approved British Grasses; to which is added, a Miscellaneous Article on Farming, with an Estimate and Description of an Example Farm of 300 acres. Illustrated with cuts of Farm Buildings. By John Donaldson, Land Steward 90
Elements of Electro-metallurgy, by Alfred Smee, F.R.S., &c., &c., &c. Second edition revised, corrected, and considerably enlarged. Illustrated with Electrotypes, and numerous wood cuts...... 93
Lectures on Chemistry; including its Applications in the Arts. By Henry M. Noad, Mem.

PAGE

Reviews—*continued.*
- Chem., and Elect. Socs. of London: Lecturer on Chemistry ... 95
- Proceedings of the London Electrical Society; Session 1842-3. Edited by the Secretary. Part VII... 95
- On the Treatment of Stone in the Bladder by Medical and Mechanical Means. By R. Willis, M.D., of the Royal College of Physicians, Physician to the Royal Infirmary for Children, &c. .. 140
- The American Journal of Science and Arts. Conducted by Professor Silliman, and Benjamin Silliman, Jun. .. 188
- On the Chemical Discrimination of Vesical calculi. By E. A. Scharling, A.A., L.L.M., Professor of Chemistry in the University and Polytechnic School, Copenhagen. Translated from the Latin, with an Appendix, containing Practical Directions for the Recognition of Calculi. By S. Elliot Hoskins, M.D. With plates. 189
- Traité de Chimie Appliquée Aux Arts. By M. Dumas. Vol. VI. ... 239
- What to do in cases of Poisoning and of Accidents. By Professor Orfila. Translated by James Rennie, A.M. 2nd edit. .. 239
- The British Quarterly Journal of Dental Surgery. Edited by J. Robinson, Esq. No. I... 239
- Magnetical Advertisements, or Diverse Pertinent Observations, and Approved Experiments, concerning the Nature and Property of the Loadstone; very pleasant for knowledge, and most needful in Practice, Travelling, or for the framing of Instruments fit for Travellers both by sea and land. By William Barlowe. A new Edition, with Notes by William Sturgeon, Lecturer to the Manchester Institute of Natural and Experimental Science... 288
- Glyphography; or Engraved Drawing, for printing at the Type Press, after the manner of Wood-cuts. With full directions for the use of Artists, Engravers, and Amateurs, and Specimen Illustrations. Second Edition. ... 333
- Photographic Manipulation; containing Simple and Practical Details of the most Improved Process of Photographic Drawing, the Daguerreotype and Calotype. Illustrated with Cuts of the various Apparatus... 333
- Scientific Teetotalism. Appendices to the Illustrated History of Alcohol. Exhibiting a View of the Accordance of Teetotalism with Recent Discoveries in Organic Chemistry, and Explaining the Modus Operandi of Alcohol. Firstly, on the Function of Respiration; and, secondly, on the Formation of Fat. By Dr. Frederick Richard Lees.... 335
- A Treatise on Food and Diet; with Observations on the Dietetical Regimen suited for Disordered States of the Digestive Organs; and an account of the Dietaries of some of the Principal Metropolitan and other Estsblishments for Paupers, Lunatics, Criminals, Children, the Sick, &c. By Jonathan Pereira, M.D., F.R.S., and L.S., &c., &c. 377
- Mr. Noad's Reply to the Unjust Review of his Work in the Philosophical Magazine 380
- The Electrical Magazine. Conducted by Charles V. Walker. No I. ... 383
- The British Quarterly Journal of Dental Surgery. No. II.. 383
- Photogenic Manipulation; containing Plain Instructions in the Theory and Practice of the Arts of Photography, Calotype, Cyanotype, Ferrotype, Chrysotype, Anthotype, Daguerreotype, and Thermography. By George Thomas Fisher, jun. Illustrated by wood-cuts.
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PAGE

Reviews—*continued.*
- of the Human Body, viz:—Indigestion, Phthysis, Nervous Atony, or Mental Depression, Diseases of the Genito Urinary Organs, &c., with cases of illustration. By Robert Venables, A.M., M.B., Incep. Candidate, Royal College of Physicians, London.. 430
- Review of The Chemist in the Medical Times 478
- Elementary Instruction in Chemical Analysis. By Dr. C. Remigius Fresenius, Chemical Assistant in the Laboratory of Giessen. With a Preface by Professor Liebig. Edited by J. Lloyd Bullock, Member of the Chemical Society, late of the Giessen and Paris Laboratories 521
- Familiar Letters on Chemistry, and its Application to Commerce, Physiology, and Agriculture. By Justus Liebig, M.D., Ph. D., F.R.S., Professor of Chemistry in the University of Giessen. Edited by John Gardner, M.D., Member of the Chemical Society...... 523
- Lectures on Polarised Light, delivered before the Pharmaceutical Society of Great Britain, and in the Medical School of the London Hospital. By Jonathan Pereira, M.D., &c., &c., &c. Illustrated by above fifty wood-cuts............ 525
- The Electrical Magazine. Part II. Edited by Charles V. Walker 526
- The Medical Times 526
- A New Series of Tables of the Elementary Bodies, systematically arranged, and adapted as tables of equivalents, or as chemical labels. By Chas. Button and Warren de la Rue. Part I.................. 527
- Practical Mineralogy; or, a Compendium of the Distinguishing Characters of Minerals, by which the name of any species or variety in the Mineral Kingdom may be speedily ascertained. By Edward J. Chapman, London.. 557
- Tables on the Characteristics of Chemical Substances; adapted to facilitate Chemical Analysis. By Simeon Shaw, L.L.D. 559

PAGE

Reviews—*continued.*
- New Methods of Alkalimetry, and of determining the commercial value of acids and manganese. By Drs. C. R. Fresinius and H. Will. Edited by J. Lloyd Bullock, late of the Giessen and Paris Laboratories.................... 559
- Applied Chemistry in Manufactures, Arts, and Domestic Economy. Edited by E. A. Parnell. With numerous engravings on wood, and other illustrations. Parts I. and II. Oct. and Nov., 1843 558

Rhatany, copaiba and, capsules of.... 425

Roots, certain, on the proper time for collecting 80

Roses, oil of, on the preparation of .. 181

Sal Ammoniac, improvements in the manufacture of............ 120

Salts, ammoniacal, action of vegetation 211

the Pharmaceutical Society .. 319

Sarsaparilla, iodised syrup of 251

Sewers, openings into the, in public streets, on the injurious effects and nuisance of 321

Skin, on the special function of 235

Silver,
- copper and iron, oxides of, action of potassium.............. 351
- nitrate of, employment of 226
- on the use of the preparations of, in syphilis 228
- nitrate of, discoloration of the skin by.................. 128

Singular fact 285

Skate liver oil, preferable to cod liver oil...................... 82

Smoke,
- nuisance, the 455
- on the production and prevention of 507
- prevention, report of the Select Committee on 498, 543

Snuff, Maccuba, lead in, poisoning by 237

Soap, prophylactic, against syphilitic infection 555

Society,
- London Electrical 70
- Pharmaceutical 223
- ———— in Liverpool and Manchester.............. 430
- ———— Museum of 86
- ———— financial statement of...................... 369
- ———— numerous intended secessions from 319
- ———— sale of poisons, the 424
- ———— the "self-dubbed

PAGE

Society—*continued.*
- representative" of the chemists and druggists of Great Britain 223
- ——— a few more questions for 320
- ——— Indefensible even by Mr. Bell.............. 273

Soda,
- acetate of, with nine atoms of water 22
- and potassa, carbonates of, improvements in manufacture of 119
- protoxide of platinum and, a double sulphite of.......... 294
- sesquicarbonate of, on the formation and composition of 114

Soda-water spigot 552
Spartium scoparium, therapeutical employment of.............. 40
Spermaceti, composition and products of distillation of, with some remarks upon its oxidation by nitric acids 162, 206, 251
Specific gravity of, considerations concerning.................. 344
Starch, patent rice 550
Stone. *See* Lime. 112

Sublimate,
- corrosive, arsenious acid, copper, and lead, antidotes for 520
- ——— new test for 328

Subscription for Madame Courtois, widow of the discoverer of iodine 87
Sugar in the perspiration and saliva of a diabetic subject.......... 133

Sulphur,
- new oxacid of 16
- carburet of, action of chlorine on................. 296, 402
- and manganese, ointment of 83
- origin of, in vegetables.......... 396
- analysis of the oxygenous compounds of................ 347

Sulphurous acid and alkaline sulphites, on some separations effected by..................... 193
Sulphuous compounds, cyanurets, and analysis of the 109
Sun, exposure to the beams of the, on a change produced by, in the properties of an elementary substance 442

Syrup,
- almond, new formula for........ 424
- antirachitic 286

Syrups of acid juices, on the processes of preparing.............. 181

TANNIN in hooping cough 229

PAGE

Tallicoonah oil.................... 187
Tapioca, adulterated, poisoning by.... 331
Tar ointment 231
Tartar, cream of, soluble, preparation of 138

Tea,
- chemical composition of, investigations concerning 530
- improved preparations of........ 406

Terbium. *See* Cerium.
Testicle, swelled, treatment of, in the earliest stage 283
Thermography, on 23

Tobacco,
- adulteration of. Frauds on the Excise 306
- deleterious effects produced by an infusion of, applied to the skins of cattle 180
- empyreumatic oil of, poisoning by

Tolu, balsam of, syrup of 421
Turpentine, electuary of............ 426
UNGENTUM cetacei................ 283
Uranium, peroxide of, on the preparation of.................. 297

Urea,
- discovered in the blood of individuals laboring under inflammation of the lungs 281
- secreted in large quantities of the peritoneum in a case of ascites 119

Urine,
- blue, note on a................ 132
- incontinence of, successfully treated by nitrate of potassa 326
- solid contents and density of, relation between 187

Urinary cabinet, Messrs. Knight and Sons' 188
Urinometer, Prout's, with Ronketti's testing apparatus.......... 430

VANILLA, therapeutical employment of 426
Varnish of an apartment, symptoms caused by 330
Vegetables, sulphur in, origin of...... 396
Vegetation, action of ammoniacal salts in 211
Veratria, iodide of potassium and, on tumefaction of the liver and dropsy 231
Vermifuge decoction, Lisfranc's 424
Voltaïc pile, new 17

WALNUT leaves, application of, to the treatment of scrofulous affections.................. 230

Water,
- action of, on the sulphurets of the alkaline metals, and the haloïd salts 7
- mineral, laxative, effervescing.... 279
- sea, aërated, new purgative...... 429
- on the combinations of, with the

hydracids................ 20
aërated, Bakewell's portable apparatus for the preparation of 233

Wax,
  Bees' 301
  Japan, on the composition of, with some remarks on its distillation and its oxidation by nitric acid 67
  on ointments and..............
  on the properties of........... 303

Wood, preservation of, by means of concentrated sulphuric acid 545
Wool. *See* Dyeing.

XENOLITE 114
Xyloïdin, on...................... 303

ZINC,
  distilled, on the, employed in Marsh's apparatus 119
  hydrocyanate of, on the effects of in nervous diseases 229

LIST OF CONTRIBUTORS.

ALBERT, D. F., Dr., 210, 216
Allé, Dr., 283, 287
Anderson, T., Dr., 113
Andral, 101
Andrews, Dr., 443
Anthon, 22
Aubergier, 35
Augouard, 331

BADELEY, J. C., Dr., 375
Ballot, C. H. D. Buys, 303
Barach, A., 232
Barreswill, 295, 305
Bartels, A., 229
Basse, Dr., 333
Baumann, 209
Baumgarten, Dr., 285
Beard, R., 29
Becquerel, 457, 499
Behrens, 401, 520
Benson, E. W., 37
Berner, H., 139
Berthier, P., 193
Berzelius, 112, 247, 291, 485
Bidard, 407, 410
Bineau, A., 20
Bird, Golding, Dr., 187
Boissière, G., 130
Bonaparte, L. L., Prince, 293, 416
Bonjean, 230, 418, 427
Bouchardat, 111, 118, 132, 211, 398, 399, 426, 520
Boudalt, 495
Boullay, 398
Boussingault, 118, 120, 166, 218, 265, 269, 362, 408, 463, 503, 547
Braconnot, H., 147
Brousse, L., 131
Brunton, 546
Buchner, Dr., 21, 80
Büchner, 81
Busse, Dr., 279

CAHOURS, A., 10, 49, 300
Calau, 477
Cambornac, 138
Carré, Dr., 37
Cauvy, 64
Chatin, 283
Chodnew, A., 351
Christison, Dr., 178, 510
Clay, W. N., 405
Clough, W. T., 119
Colla, Dr., 80
Collier, G. F., Dr., 183
Cooke, E. F., 171
Cooley, A. J., 36, 78, 373, 425
Coulton, Dr., 186

DAGUERRE, 313
Daniell, J. C., 34
Davallon, 518
Davidson, W., Dr., 230
Dégrange, 86
Deschamps, 550
Desmarres, 424
Devergie, Dr., 552
Dick, Dr., 280
Dircks, H., 506
Dobrowolsky, Dr., 254
Dœbereiner, J. W., 495
Dornblüth, Dr., 80
Draper, Professor, 442, 444
Duesterberg, Dr., 556
Dufrenoy, 111
Dumas, 10, 49, 59, 212, 269
Dupasquier, Dr., 82
Duport, Saint-Clair, 306, 355

EBELMEN, 309
Emery, 287
Embling, 283
Enderlin, C., Dr., 497
Erdmann, O. L., 113
Errard, Dr., 227

Farre, T. J., Dr., 276
Festeggiano, Dr. G., 87
Filhol, 78
Fordos, 16, 160, 347, 349
Fox, R. W., 337
Frampton, A., Dr., 328
Frémy, E., 65, 103
Frerichs, Dr., 56
Fresenius, R., Dr., 97, 149

Gamberini, 229
Gannal, 365
Garot, 285
Gavarret, 101
Gay-Lussac, 339
Gerdy, 109
Gélis, 16, 160, 347, 349, 385
Gerhardt, 199, 245, 303
Girardin, 407, 410
Glass, W., 402
Glénard, 495
Gmelin, L., 111
Gobley, 280
Graham, A., 186
Graham, H., Dr., 128
Griffith, 281
Gruenbaum, Dr., I. 556
Guibourt, 156

Hæusler, Dr., 424
Haidlen, J., Dr., 97, 149, 353
Hamilton, M., Dr., 217
Hare, R., Dr., 437, 488, 533
Hayden, C. B., 305
Hayn, J., Dr., 375, 421
Hermann, 114
Herryppon, M.D., 425
Herschmann, Dr., 426
Hildreth, Dr., 376
Hiley, J. S., Dr., 180
Hirtz, Dr., 139
Hochstetter, 28
Hodgson, T., 234
Hogan, B. R., 279
Holland, C., Dr., 328
Houston, Dr., 225
Hunt, Robert, 23, 445, 481, 463
Huraut, 396

Jacobi, 29
Jacquelain, 360
Jacquemart, 200, 272
Jammes, 400
Jankowitz, Dr., 287
Joblonouski, 406
Jones, B., Dr., 188
Joule, J. P., 446

Kagenbusch P., 263
Kane, R., Dr., 119
Kauser, Dr., 40
Klier, J., 34
Knox, Rev. T., 447
Konuke, O., 181
Kolbe, 296

Lafargue, R. A., 226
Landerer, Dr., 426, 259
Larocque, A., 135, 177
Lassaigne, J. L., 145, 197, 541
Laurens, S. 312
Laurent, A. 299
Lawes, J. B., 72
Lebregondi, 229
Lechi, 166
Lembert, 258, 259
Leonhard, Dr., 227
Leroy, F. G., 181, 519
Levol, A., 259
Lewinstein, Dr., 41
Lewy, 301
Liebig, Professor, 55, 115, 315, 411
Litton, A., 294
Löwel, 299

Magendie, 336
Magonty, Professor, 344
Mahier, P., 119
Maclagan, Dr., 427
Malaguti, 161, 297
Marchand, 56, 105, 113, 153
Marcus, 287
Matteuci, 108
Manthuer, Dr., 230,
Meillet, 354
Meirieu, Dr., 38
Meissner, Dr., 39
Mercurio, Dr., 228
Mettauer, J. P. Dr., 125
Meyer, Dr., 133
Meyerhofer, Dr. 556
Mialhe, 326
Mignot, M. de, 557
Michiels, 426
Mililotti, M. A., Dr., 82
Millon, E., 289
Morin, 389
Mosander, Professor, 446
Mowbray, G. M., 414, 468, 507
Murphy, P. J. Dr., 436, 542
Murray, Sir James, M.D., &c., 71
Muspratt, J. S., 433

Nasse, Dr., 133
Nicol, J. I., Dr. 552
Noad, H. M., 72

Osann, G., 31
O'Shaughnessy, Dr., 127, 185
Otto, Professor, 237

Parkin, J., 224
Payen, 332, 333
Payen, 120, 166, 218, 269, 408,
Pedroni, 543
Péligot, E., 230

Pelouze, J., 19, 241
Petzholdt, A., Dr., 385,
Pfeiffer, Dr., 555
Phillips, Reuben, 15, 60, 205, 493, 529
Phillips, S. E., 538
Pitschaft, Dr., 81
Poulenc, 62
Poumet, 283
Prater, H., 69
Preston, 283
Prevost, 389
Proctor, W. jun., 87

Quadri, 230

Rademacher, Dr., 555
Reiken, 278
Reinsch, H., 83, 112, 138
Richter, Dr., 333
Ricord, 521
Righini, G., 139, 184
Rochleder, F., 158, 450
Roelands, Dr., 554
Roeser, Dr., 134
Rogers, 128
Romanet, 287
Rose, H., 7
Rousse, Dr., 84
Rousseau, 304

Salvolini, Dr., 228
Scharn, 227
Schleiser, Dr., 428
Schlesinger, 161
Schlossberger, Dr., 165
Schlumberger, H., 263
Schnedermann, 294
Schönbein, 17
Schreiber, Dr., 556
Schwabe, Dr., 331
Searle, C., 406
Silliman, B., jun., 21
Simon, F., Dr., 281
Simpson, Professor, 374
Smee, A., 231
Smith, J. L., Dr., 154, 162, 206, 251
Sobrero, 299
Soubeiran, E., 277, 421
Spencer, T., 444
Stanley, 85
Stewardson, Dr., 427
Sthamer, B., 67
Strohl, Dr., 39

Talbot, W. H. F., 31
Thibierge, A., 135, 177
Thomas, 312
Thompson, Lewis, 436, 497, 510
Thompson, E., 144, 192, 240, 288, 336, 384, 432, 480, 528, —
Todd, J., Dr., 37
Turnbull, Dr., 231
Tracy, C., 27
Tsuhierschki, 285

Vanier, Dr., 286
Versepuv, Dr., 361
Virey, 257
Vogel, Senr., Dr., 481
Vogel, Junr., 5, 541

Wafelbakker, Dr., 232
Wansbrough, S. W., 238
Waterton, H., 120
Watson, Dr., 40
Watt, John, Editorial Articles.
Watt, Charles, Senr., 3, 321 (also editorial articles)
Watt, Charles, Junr., 22, 70, 162, 484 521, 4
Weeks, W. H., 69
Weihe, Dr., 231
Werther, Dr., 117
West, 444
Whiteley
Will, 393, 447
Willis, R., Dr., 235
Wöhler, 55, 256
Wolf, Dr., 260
Wurtz, A., 63
Young, J., Dr., 326

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